

OCTOBER 2009

City of San Carlos

Climate Action Plan

Prepared by the City of San Carlos Planning Department and the
General Plan Advisory Committee (GPAC) Climate Action Plan Subcommittee



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The following is a list of common conversions used throughout the San Carlos Climate Action Plan. The 'City of San Carlos – General Greenhouse Gas Conversions' are average estimates of the greenhouse gases (GHGs) produced by a unit of natural gas, electricity, and VMT within the City of San Carlos in calendar year 2005. The purpose of these conversion estimates is to provide an estimate for the reader to visualize the GHG equivalent of activities within the City. The calculations within the Climate Action Plan will not always match the average conversion estimates below due to variable source information; however these estimates are generally appropriate. For more information on greenhouse gas calculations, please see Appendices B, C, and E.

Quantity	Value	Notes
Standard Unit Conversions		
1 pound (lb)	0.0004536 metric tons (tonnes)	Engineering Standard
1 short ton (ton)	0.9072 metric tons (tonnes)	Engineering Standard
1 metric ton (tonne)	1.1023 short tons (tons) 2,204.62 pounds (lbs)	Engineering Standard
1 kilowatt hour (kWh)	3,412 Btu (Btu)	Engineering Standard
1 therm	100,000 Btu (Btu)	Engineering Standard
City of San Carlos – General Greenhouse Gas Conversions for baseline 2005 calculations		
1 kilowatt hour (kWh)	0.492859 lbs Co2e	PG&E 2005 emissions factor certified by the California Climate Action Registry
1 MMBtu	53.05 kilograms (kg) CO2e	PG&E CO2e emissions factor for delivered natural gas, certified by the California Climate Action Registry and CEC
1 Vehicle Mile Traveled (VMT)	1.077 pounds (lbs) CO2e	Average estimate calculated by dividing total CO2e derived from EMFAC and CACP by total VMT. Individual calculations may vary from this average coefficient based on model year and vehicle class.
1 short ton landfilled waste	0.277 metric tons CO2e	Average estimate calculated by dividing total emissions from landfilled waste derived from EPA's WARM model and CACP by total tons landfilled. Individual calculations may vary from this average coefficient based on type of waste landfilled and waste management practices.

Executive Summary

The City of San Carlos Climate Action Plan (hereafter referred to as “Plan”) serves as a guiding document to identify ways in which the community and City can reduce greenhouse gas emissions and adapt to the inevitable effects of climate change. Specifically, the Plan does the following:

- ❏ Identifies sources of greenhouse gas emissions caused from actions within the City of San Carlos municipal boundary and estimates how these emissions may change over time;
- ❏ Provides energy use, transportation, land use, and solid waste strategies to bring San Carlos’ greenhouse gas emissions levels to 15% below 2005 levels by 2020 and 35% below 2005 levels by 2030;
- ❏ Mitigates the impacts of San Carlos on climate change (by reducing greenhouse gas emissions consistent with the direction of the State of California via AB32 and Governor’s Order S-03-05 and Public Resources Code section 21083.3). The CEQA Guidelines encourage the adoption of policies or programs as a means of addressing comprehensively the cumulative impacts of projects. (See CEQA Guidelines, §§ 15064, subd. (h)(3), 15130, subd. (c).)
- ❏ Allows the greenhouse gas emissions inventory and Climate Action Plan to be updated every five years and respond to changes in science, effectiveness of emission reduction measures and federal, state, regional or local policies to further strengthen the City’s response to the challenges of climate change.
- ❏ Provides substantial evidence that the emission reductions estimated in the Climate Action Plan are feasible.
- ❏ Serves as the programmatic tiering document for the purposes of CEQA within the City of San Carlos for climate change, by which applicable developments within the City will be reviewed. If a proposed development is consistent with the emission reduction and adaptation measures included in the Climate Action Plan and the programs that are developed as a result of the CAP, the project would be considered to have a less than significant impact on climate change and emissions consistent with the direction of the California Attorney General (Climate Change, CEQA and General Plans, Revised March 6, 2009) and Public Resources Code 21083.3.
- ❏ Outlines ways in which the City can prepare for and adapt to the consequences of climate change; and,
- ❏ Discusses the various outcomes of reduction efforts and how these reduction efforts can be implemented and advertised;

The strategies to reduce greenhouse gas emissions are organized into 21 reduction measures with various components to each reduction measure. Measures are then separated into energy use, transportation and land use, and solid waste categories.

The reduction measures are projected through 2030 with 2020 serving as an interim target. The Climate Action Plan Subcommittee ("Subcommittee"), the community of San Carlos, and City staff chose the reduction measures through a collaborative process. Each reduction measure is analyzed with estimates of initial monetary cost to the City and reduction in greenhouse gas emissions, culminating in an overall recommendation of implementation priority.

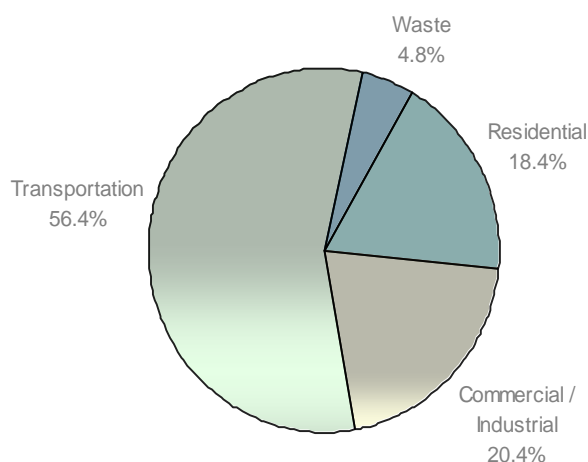
This report is a significant landmark in San Carlos' proactive approach to reducing and adapting to the effects of climate change. It builds upon residents' existing commitment to sustainability by formalizing the process of measuring and addressing greenhouse gas emissions. It also breaks new ground by being developed with the purpose of incorporating the outlined emission reduction strategies as components of the General Plan Update and corresponding Environmental Impact Report. By integrating climate action into the General Plan, San Carlos will ensure that the issue becomes an integral part of the planning process.

"The City of San Carlos will work with residents and businesses as well as in conjunction with neighboring cities, counties and other agencies interested in this matter to progress on reducing greenhouse gas emissions and to reduce global warming pollution levels."

– The San Carlos Climate Protection Letter

For the full picture of San Carlos' efforts to reduce greenhouse gas emissions and reduce the effects of climate change, please visit www.cityofsancarlos.org. As programs are developed to respond to the emission reduction measures outlined in this Plan, they will be explained and tracked on the City's website. Assistance and involvement from the community (including residents, businesses, schools and government agencies) will be crucial to the success of this Plan's implementation. The San Carlos community should be proud to take part in San Carlos' commitment to sustainability, of which this Climate Action Plan is a part.

Community-Wide Greenhouse Gas Emissions



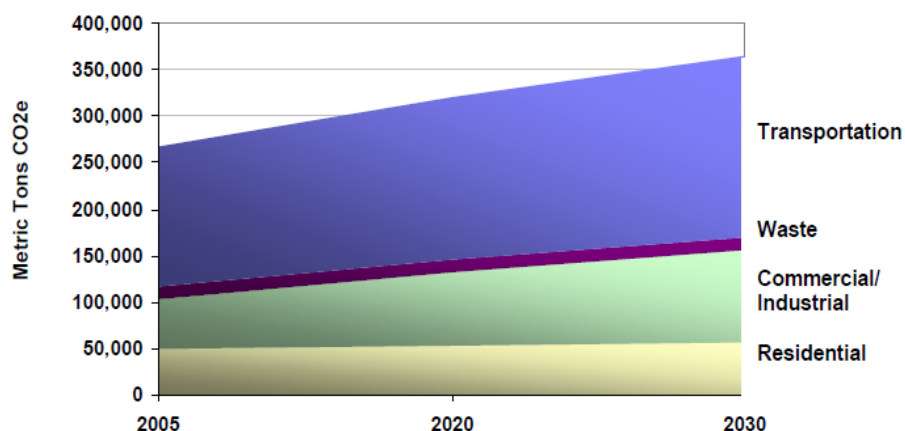
Activities within the jurisdictional boundary of San Carlos within calendar year 2005 caused an estimated 267,237 metric tons of carbon dioxide equivalent (CO₂e) to be released into the atmosphere. The largest source of emissions (56%) was a result of highway and local road vehicular travel.

The emissions from municipal operations are currently contained within the Commercial/Industrial category. A separate municipal greenhouse gas inventory has been developed and included as

Appendix E.

If the community of San Carlos continues with the 2005 pattern of energy consumption, travel, and waste production, the level of greenhouse gas emissions is estimated to increase to 321,519 metric tons per year by 2020 and 365,787 metric tons per year by 2030. These “business-as-usual” forecasts of 20.3% and 36.9% higher than 2005 levels, respectively, are due to estimated increases in consumption, population, households, and commercial activity as outlined in the General Plan buildout scenario.

2030 Greenhouse Gas Emissions Forecast by Sector



Achieving San Carlos' Reduction Target

The Climate Action Plan Subcommittee developed a strategic policy focus to direct the development of the Climate Action Plan and associated emission reduction measures. The policies focus on the following:

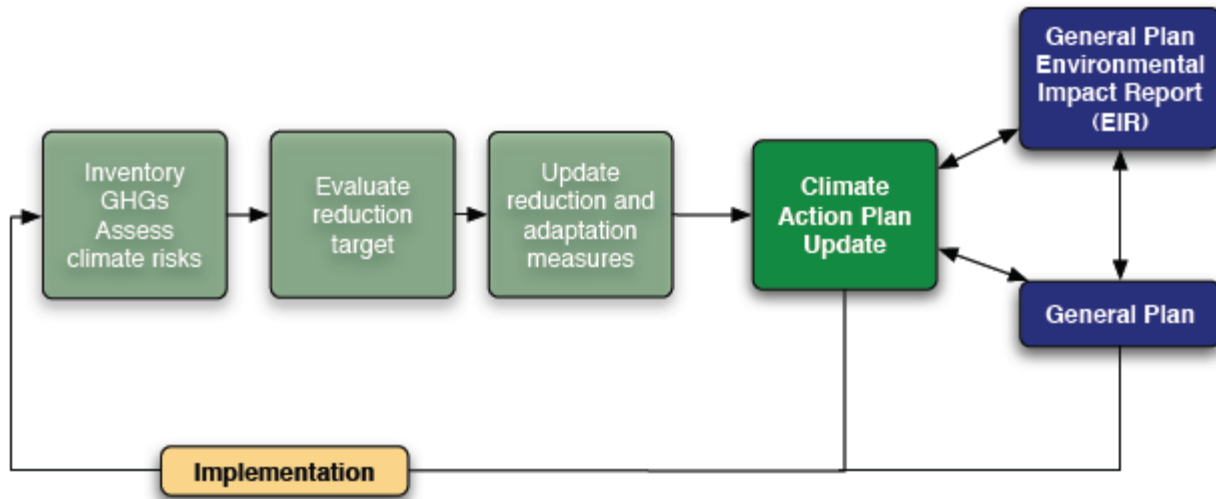
1. Building Efficiency / Site Design
2. Auto Emission Reduction
3. Low Carbon Energy Use
4. Alternative, Non-automotive Travel Modes
5. Waste Reduction Program

The Subcommittee was responsible for reviewing and analyzing strategies aimed at reducing the greenhouse gas emissions from energy consumption, transportation, land use, and solid waste production. Over one hundred possible reduction measures were initially considered. The Subcommittee narrowed this list to 31 measures based on feasibility, cost-effectiveness, and appropriateness to the community. The public then came together at a workshop to form the final 23 reduction measures, which were subsequently condensed into 21. The process of selecting and clarifying San Carlos' reduction measures is explained further in Appendix D.

General Plan Integration

The Climate Action Plan will be updated to analyze new reduction targets and efforts. The General Plan accommodates the Climate Action Plan update process by dynamically referencing sections of the Climate Action Plan instead of concrete text. This will ensure that the City and its planning resources are continuously up to date. The five-year CAP update process and its relation to the General Plan are depicted below.

The Five-year CAP Update Process and its Relation to the General Plan



Energy Use Reduction Measures

The second largest contributor to San Carlos' greenhouse gas emissions (39%) comes from residential, commercial, and industrial energy use in San Carlos. To address this significant cause of greenhouse gas emissions, the following measures were formed:

- ❏ Adopt a green building standard for new development and major remodels.
- ❏ Expand energy saving opportunities to businesses.
- ❏ Create water and waste efficient landscapes.
- ❏ Improve residential energy efficiency.
- ❏ Identify opportunities for on-site renewable energy generation on City and privately-owned property.
- ❏ Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.
- ❏ Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.
- ❏ Encourage tree planting.

Green Building Standards for new development and major remodels.

Energy Use Reduction Measure Highlight

Description: Two green building standard options were analyzed: 1) Provide information on green building certifications and 2) Create a local green building ordinance referencing Leadership in Energy and Environmental Design (LEED), Build It Green (BIG) GreenPoint Rated, or equivalent rating systems.

Emission Reduction: The analysis revealed that San Carlos will save 535.5-11,868 metric tons of carbon dioxide equivalent (CO₂e) per year by 2030 depending on which option was chosen.

These measures were expanded upon and analyzed through various components. The reduction estimates for each measure are structured in a way that if the City discovers a component of the reduction measure is no longer feasible, it can be replaced with another component and still achieve the measure's overall target. All of the measures identified above are expected to save at least 42,369 metric tons of CO₂e per year by 2030.

Transportation and Land Use Reduction Measures

The transportation sector is the largest contributor to greenhouse gas emissions in San Carlos (56%). The majority of these emissions are from vehicles traveling on the length of State Highway 101 running through San Carlos. Transportation and land use are combined into one section because they are highly integrated. In many cases, it requires a change in land use patterns to alter the need for personal automobile use and move towards more fuel efficient vehicles. The transportation and land use measures are as follows:

- ❖ Encourage development that is mixed-use, infill, and higher density.
- ❖ Provide for an education program and stepped up code enforcement to minimize vegetation that degrades access along public rights of way.
- ❖ Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.
- ❖ Increase bike parking.
- ❖ Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.
- ❖ Provide for a shuttle service connecting areas not adequately served by public transit.
- ❖ Increase housing density near transit.
- ❖ Promote car sharing programs.
- ❖ Increase accommodation and promotion of alternatively fueled vehicles and hybrids.
- ❖ Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, and walking.

Encourage development that is mixed-use, infill, and higher density.

Transportation and Land Use Reduction Measure Highlight

Description: The principles of infill, high density, and mixed-use development lead to decreased vehicle miles traveled and increased neighborhood vitality. They also have multiple social benefits, including: better health, lower infrastructure costs, and increased accessibility.

Emission Reduction: The analysis revealed that San Carlos can save 5,544 metric tons of CO₂e per year from reduced vehicle trips and shared building materials as a result of higher density, mixed-use development.

These measures are estimated to save 14,109 metric tons of CO₂e per year by 2030. As with the energy sector, each measure's portion of the total reduction target is flexible. If a component of a reduction measure becomes infeasible, it can be adjusted as long as the overall measure's target is accounted for.

Solid Waste Reduction Measures

The waste from San Carlos residents and businesses accounts for 4.78% of San Carlos' yearly greenhouse gas emissions, or 12,777 metric tons of CO₂e. While a small portion of overall emissions, the community has a great deal of control over these emissions. The measures to reduce emissions from solid waste are as follows:

- For municipal operations, establish a zero waste policy.
- Make recycling and composting mandatory at public events.
- Increase overall waste diversion by 1% per year.

These reduction measures are estimated to reduce greenhouse gas emission by 6,560.7 metric tons of CO₂e per year by 2030.

Increase overall waste diversion by 1% per year

Solid Waste Reduction Measure Highlight

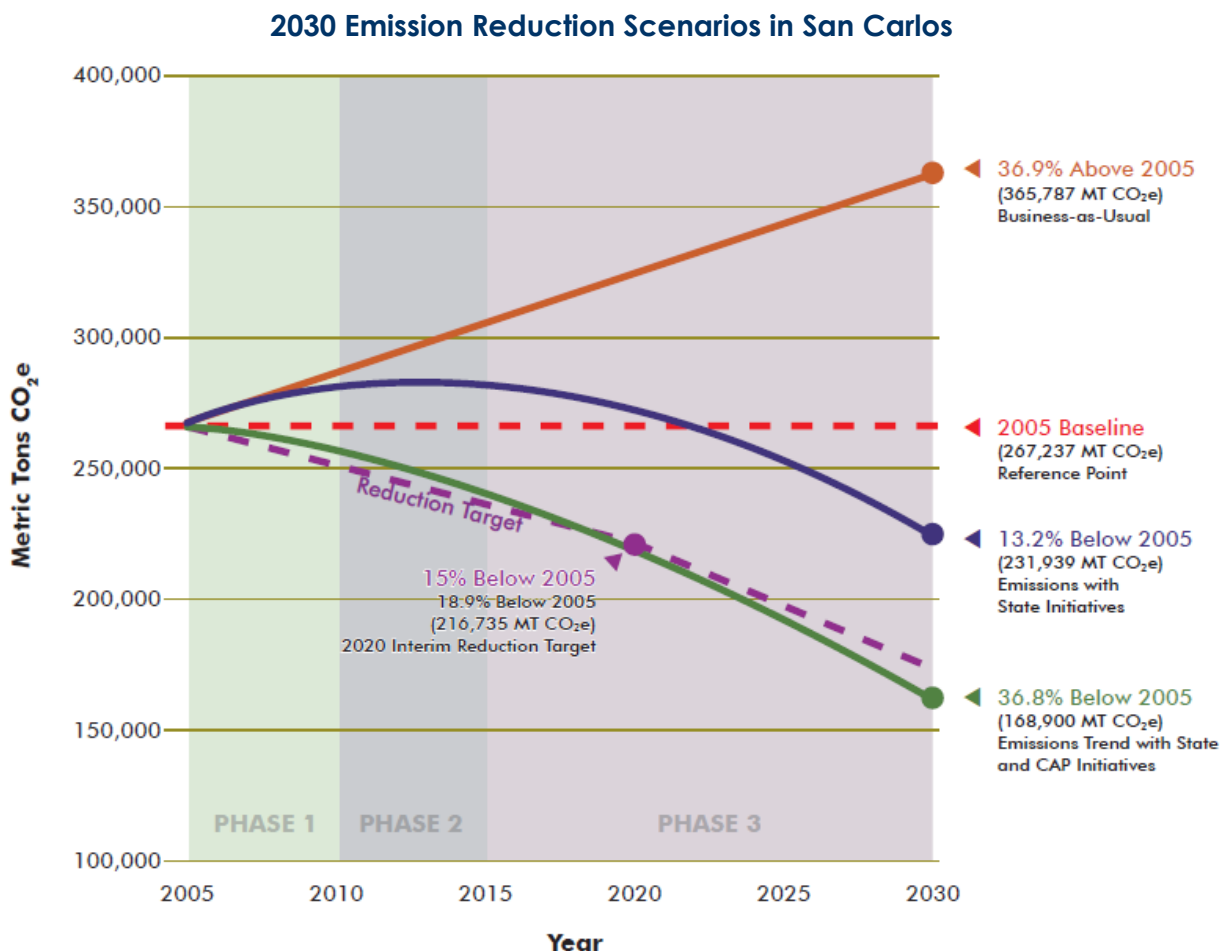
Description: San Carlos will reduce solid waste generation by a minimum of 1% per year. Steps taken to achieve this goal may include increasing the required construction and demolition diversion rate beyond the 50% currently required by the State and providing expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.

Emission Reduction: San Carlos can save at least 6,222 metric tons of CO₂e per year by 2030.

Findings

The quantifiable reduction measures included in this plan are estimated to save at least 63,039 metric tons of CO₂e per year by 2030 when implemented. We are confident that this significant decrease in local emissions, in concert with State initiatives for renewable energy and vehicle efficiency will result in the City meeting, if not exceeding, our emission reduction target of 15% below 2005 levels by 2020 and 35% below 2005 levels by 2030.

It is important to note that while we begin implementation of the measures of this document, emissions will continue to rise due to population growth and consumption trends. This makes our reduction target challenging but feasible; the decrease in per capita emissions as a result of the measures in this Plan will be working against an increase in overall emissions due to population and job growth. This trend is shown in the graph below. The business-as-usual red line is what we can expect without a decrease in per capita emissions, the horizontal dotted line is a representation of constant 2005 emissions rates as a point of reference, and the bottom dotted line is our reduction target. If we look at the difference between our reduction target and business-as-usual projections, we see that the actual reduction needed from business-as-usual to reach our target is actually over 72%.



Possible scenarios for meeting the 2030 targets set forth in this Plan are depicted above and explored in greater detail in the body of this Climate Action Plan. The curved lines in the graph above represent phased implementation of the reduction measures in this Plan as well as State and regional initiatives. As shown through the lower green line above, we expect our 35% reduction target to be achieved through a combination of the reduction measures included in this Plan and State initiatives such as the renewable energy portfolio standard and implementation of recent State legislation. The overall emission reductions anticipated through these efforts are outlined in the table on the following page.

Reduction Target Analysis

		2020 Metric Tons CO ₂ e per year	2030 Metric Tons CO ₂ e per year
Reference Year Business-As-Usual Emissions Projection		321,519	365,787
1	Energy Use Strategies	-24,496	- 42,369
2	Transportation and Land Use Strategies	-12,886	-14,109
3	Solid Waste	-4,815	-6,561
Subtotal – Emissions with CAP		279,342	302,748
4	Renewable Portfolio Standard	- 13,834	- 31,566
5	Pavley I and II	- 34,649	- 91,978
6	Low Carbon Fuel Standard	- 14,124	-10,304
Total – Emissions with CAP and State Programs		216,738	168,900
Base Year 2005 Community Emissions		267,237	267,237
Percent below 2005 Level		18.9%	36.8%

* The reduction potential of new Title 24 requirements have not been technically analyzed.

Implementation

This report lays the groundwork for a more important task ahead – implementation. The 21 reduction measures are crucial to attaining San Carlos' reduction goal of 35% below 2005 levels by 2030. The San Carlos Climate Action Plan is a foundation for this effort that will be revised and built upon for years to come. Reduction measures will continue to evolve as new climate-related technology, policy, and resources become available. That is why an essential part of implementation of this document is reassessment.

It is suggested that the City update the 2005 Community Greenhouse Gas Emissions Baseline Inventory every five years to see how emissions have changed since the 2005 baseline year. These updated reports will be two-pronged, first reporting emissions using present quantification methodology and protocol in order to create a basis of comparison and secondly reporting emissions using an up-to-date methodology and protocol that will likely capture other sources of emissions that we are currently unable to calculate with today's research methodologies and analysis tools. As a result of these updated inventories, this Climate Action Plan and corresponding reduction measures will be revisited. Attention will be shifted to those sectors displaying faster growth rates than others and to those emission reduction measures which are having greater success at reducing emissions with less cost than other measures.

As part of the adaptation element of this plan, it is recommended that the City prepare itself internally for climate change resiliency. A sustainability coordinator among City Staff and established points of contact to inform and collaborate with resident groups, businesses, schools, City departments, and government agencies to address potential threats of climate change is a way of guaranteeing timely and efficient response to climate challenges.



Timely implementation, along with the initiative of each resident, employee, and business of San Carlos, will put us well on our way to reducing our impact on the earth and the community in which we live while also preparing us for the challenges that lie ahead as a result of the inevitable transformations associated with climate change.

Suggested Implementation Prioritization

This chapter separates reduction measures into three time periods for implementation: 2005 to 2010, 2010 to 2015, and 2015 to 2020. Phases indicate when implementation of the measure begins; the reduction effects and overall maintenance of the program will extend well beyond the allotted phase. All reduction measures will begin implementation by 2020. The period of 2020 to 2030 will be an extension of Phase 3 for evaluation and expansion of all reduction measures. The reduction measures in this Plan are structured in a way that if a component of the measure becomes infeasible, other components can be added or modified, allowing the overall measure's reduction target to still be met.

Phase 1: Reduction Measures to Begin Implementation 2005 to 2010

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO2e per year)	First Year Costs per Metric Ton CO2e	Estimated Cost to City
25	Expand energy saving opportunities to businesses	13,300	\$0.18-\$0.38	\$2,500 - \$5,000
27	Improve residential energy efficiency	14,115	\$0.84	\$10,000
50	Encourage development that is mixed-use, infill, and higher density	5,544	\$0.81-\$1.62	\$4,500 - \$9,000
52	Increase housing density near transit	4,957	\$4.54 - \$9.08	*\$22,500 - \$45,000
55	Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools	170	\$923.52	**\$157,000
59	Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking	122	Negligible	***\$24,000 - \$48,000
66	Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles	59	\$6,537-\$7,027	***\$385,740 - \$414,648
77	Increase overall waste diversion by at least 1% per year	6,222	Negligible	Negligible
65	Enforce affordable housing development standards	192	Negligible	Negligible

*This cost would be included as part of the Zoning Ordinance update following adoption of the General Plan.

**This cost has been partially addressed through the recent installation of bicycle sharrows (Approx. \$45,000), implementation of the 2003 Bicycle and Transportation Plan, as well as Federal stimulus funding for crosswalks and curb ramp improvements (\$550,000).

***This cost would be reflected in the Equipment Replacement fund which would cover future costs as vehicles are replaced over time.

Phase 2: Reduction Measures to Begin Implementation 2010 - 2015

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO ₂ e per year)	First Year Costs per Metric Ton CO ₂ e	Estimated Cost to City
31	Adopt a green building standard for new development and major remodels.	11,868	\$0.93	\$10,000
36	Create water and waste efficient landscapes.	416*	\$4.81-\$9.62	\$2,000 -\$4,000
37	Identify opportunities for on-site renewable energy generation on City and privately- owned property	394	\$1,282-1,320	**\$10,000
41	Implement reduction strategies included in the energy audit of City facilities and continue to monitor City facility performance	16	N/A	Unknown
42	Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect	2,320	Negligible	Negligible
43	Encourage tree planting	356	\$35.96- \$71.91	\$12,800 -\$25,600
53	Increase bike parking	125	\$6 - \$12	\$900 - \$1,800
74	Support zero waste	83.7	\$59.74	\$5,000
76	Increase recycling and composting at public events	255	Negligible	Negligible

* These emissions are not included in the final reduction target analysis as emissions associated with the filtration and movement of water were not included in the City's baseline Greenhouse Gas Inventory as a disaggregated total.

**This cost would cover a feasibility study of on-site energy generation.

***This cost would partially be covered by the existing Building Division Code Enforcement Program.

Phase 3: Reduction Measures to Begin Implementation 2015 - 2020

Page	Reduction Measure	Emissions Reductions (Metric tons CO2e per year)	First Year Costs per Metric Ton CO2e	Estimated Cost to City
62	Provide for a shuttle service in order to increase transit ridership	1,733	\$1.15 - \$2.30	\$2,000 - \$4,000
63	Promote car sharing programs	1,158	\$1.55 – \$3.11	\$1,800 - \$3,600
67	Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles	49	\$200	\$10,000

I. Introduction



The City of San Carlos realizes the challenges that climate change poses to our community and is committed to proactively addressing the issue. In May 2008, the City Council approved the San Carlos Climate Protection Letter, making a formal commitment to calculating the community's greenhouse gas emissions and incorporating climate action into the City's General Plan update. In June 2008, the Climate Action Plan Subcommittee was formed as a subset of the General Plan Advisory Committee

(GPAC) to oversee the formation of a Climate Action Plan.

In order to measure future progress, San Carlos developed the 2005 Community-Wide Baseline Greenhouse Gas Emissions Inventory in August 2008 with the help of Local Governments for Sustainability (ICLEI) for data collection, analysis and management. The baseline report, attached as Appendix C, reveals the major sources of emissions caused from community activities and gives us a basis of comparison.

In response to the findings of the Inventory, the Climate Action Subcommittee chose a reduction target of 15% below the baseline 2005 greenhouse gas emissions levels by 2020. The Subcommittee chose this reduction target for two reasons: 1) To affirm the City's commitment to developing and measuring greenhouse gas reduction measures, and 2) To remain consistent with the AB 32 Scoping Plan recommended reduction target of 15% below present levels by 2020. The reduction target was also projected to reflect the timeline of the General Plan update. Our reduction target of 35% below 2005 levels by 2030 uses the 15% reduction target by 2020 as an interim target.

Although San Carlos has taken significant steps in the past to address climate change, this is the first document to assemble the City's climate action efforts into one centralized plan. The San Carlos Climate Action Plan is the beginning of an ongoing evaluation and reassessment of our response as a community to climate change. This Plan is by no means a strict road map through the year 2020. Future reports will evaluate progress and modify or expand current reduction and adaptation strategies as we learn more about our own community and about climate change.

This report identifies and analyzes ways in which San Carlos can attain its reduction goal through energy use, transportation and land use, and solid waste reduction measures. These strategies, included in Chapters 4-6, are the result of Subcommittee, City staff, and community cooperation during multiple public meetings, a community workshop and Council guidance through the San Carlos Climate Protection Letter.

Also included in this Plan is a section on potential adaptation strategies that may be necessary as the climate changes and sea levels rise. Adaptation measures are important in order to allow our community to proactively prepare for potential effects

of climate change to come. It has become clear that regardless of the efforts to reduce greenhouse gas emissions, not all the effects of climate change can be prevented or reversed. The challenge will be reducing the effects to the lowest level possible and having our community remain healthy and prosperous. We must ensure that we are prepared for the potential resource constraints and climate variability anticipated as a result of climate change.

CAP Purpose and Structure

The City of San Carlos is taking a proactive approach by developing this Climate Action Plan as a component of the 2009 General Plan update. Addressing climate change in this manner defines San Carlos as an innovative member of the local government community by creating a legally defensible approach to ensuring that this Climate Action Plan is implemented.

Specifically, this Plan does the following:

- Identifies sources of greenhouse gas emissions caused from actions within the City of San Carlos municipal boundary and estimates how these emissions may change over time;
- Provides energy use, transportation, land use, and solid waste strategies to bring San Carlos' greenhouse gas emissions levels to 15% below 2005 levels by 2020 and 35% below 2005 levels by 2030;
- Mitigates the impacts of San Carlos on climate change (by reducing greenhouse gas emissions consistent with the direction of the State of California via AB32 and Governor's Order S-03-05 and Public Resources Code section 21083.3). The CEQA Guidelines encourage the adoption of policies or programs as a means of addressing comprehensively the cumulative impacts of projects. (See CEQA Guidelines, §§ 15064, subd. (h)(3), 15130, subd. (c).)
- Allows the greenhouse gas emissions inventory and Climate Action Plan to be updated every five years and respond to changes in science, effectiveness of emission reduction measures and federal, state, regional or local policies to further strengthen the City's response to the challenges of climate change.
- Provides substantial evidence that the emission reductions estimated in the Climate Action Plan are feasible.
- Serves as the programmatic tiering document for the purposes of CEQA within the City of San Carlos for climate change, by which applicable developments within the City will be reviewed. If a proposed development is consistent with the emission reduction and adaptation measures included in the Climate Action Plan and the programs that are developed as a result of the CAP, the project

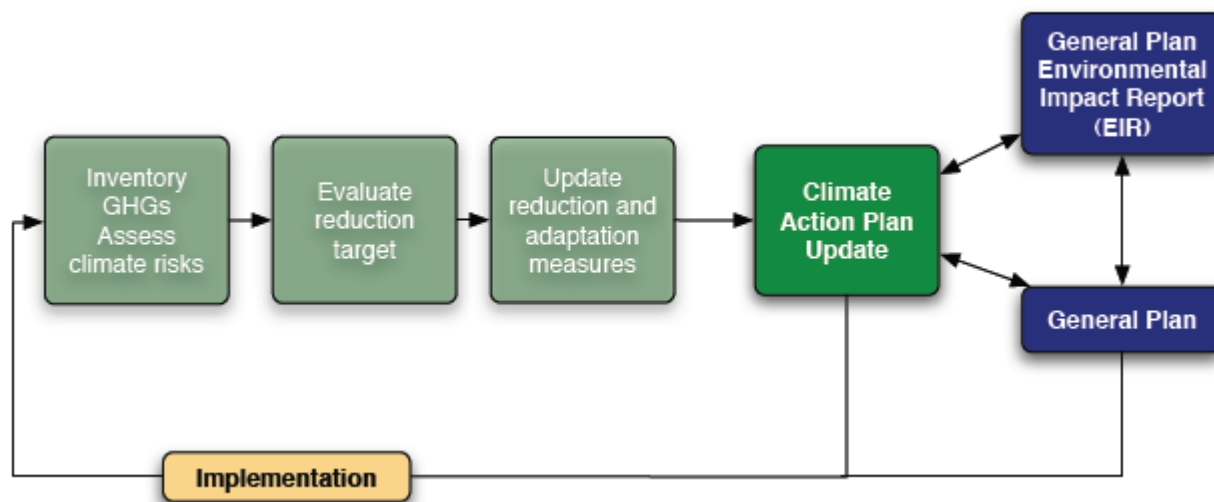


would be considered to have a less than significant impact on climate change and emissions consistent with the direction of the California Attorney General (Climate Change, CEQA and General Plans, Revised March 6, 2009) and Public Resources Code 21083.3.

- ✚ Outlines ways in which the City can prepare for and adapt to the consequences of climate change; and,
- ✚ Discusses the various outcomes of reduction efforts and how these reduction efforts can be implemented and advertised;

Instead of including the text of this Plan in the General Plan, the General Plan will dynamically reference this Plan. Dynamic references will allow the Climate Action Plan to be updated on a more regular basis than the General Plan, ensuring that the General Plan and San Carlos's climate efforts are always up to date. This flexibility is especially important given the constant flux of new research findings, technological improvements, and policy updates dealing with climate change. The CAP update process and its relation to the General Plan are depicted in Figure 1, below.

Figure 1
Five-Year Climate Action Plan Update Process and Relation to the General Plan



This document outlines reduction measures and recommendations for implementation; however it is not a technical implementation plan for San Carlos programs and community actions. City staff, community organizations, and individuals will work together to create the individual programs based on the goals, policies and actions outlined in this report.

It is important to realize that despite their relatively small size in comparison to the global issue of climate change, cities and counties collectively have the ability to reduce greenhouse gas emissions and make an impact on the larger, global climate condition. Making these goals of reduction and adaptation a reality requires a collective effort on the part of the community. No one sector, resident or entity can achieve these

reductions alone. We must all take part in order to achieve our emission reduction goals. Residents, city officials and businesses must all be involved in the ongoing implementation of these measures.

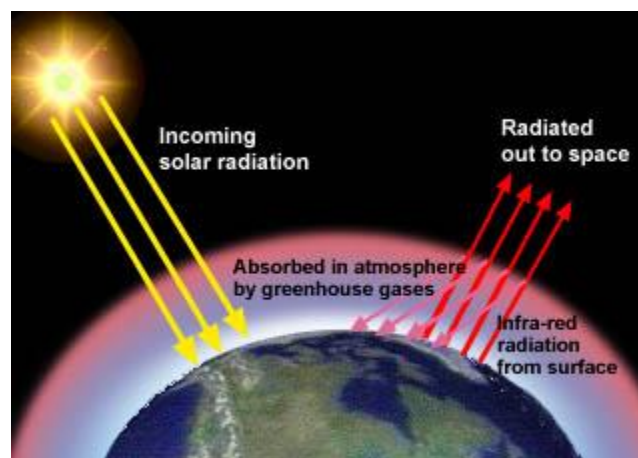
This community's plan to address our contribution to and reaction to climate change is a unique opportunity for the City of San Carlos. Climate action is not only about reducing greenhouse gas emissions, but creating a more sustainable, livable, and equitable community.

Climate Change – Global Issue, Local Problem

The existing and anticipated effects of climate change are now hard to ignore. Twelve of the past 13 years have been the hottest temperatures on record since instrumental records began in 1850. The ocean rose faster in recent years than it ever has before. 'Climate change' and 'global warming' are hot topics in mainstream American culture, resulting in books, public education campaigns, and a myriad of 'eco-friendly' consumer products. American society is growing an awareness linking energy, climate change, and our own personal activities to the environment and economy. As Californians, we choose to lead the nation in addressing this global issue with the hope that through collective action at the local level, global changes in the way we use resources and develop as a society will change and ultimately reduce the impacts of climate change on the human and natural environment.

To fully understand global climate change it is important to recognize the naturally occurring "greenhouse effect" and to define the greenhouse gases (GHG) that contribute to this phenomenon. The temperature on Earth is regulated by this greenhouse effect, which is so named because the Earth's atmosphere acts like a greenhouse, warming the planet in much the same way that an ordinary greenhouse warms the air inside its glass walls. Like glass, the gases in the atmosphere let in light yet prevent heat from escaping.

Figure 2
The Greenhouse Gas Effect



Source: Tufts University

GHG are naturally occurring gases such as water vapor, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) that absorb heat radiated from the Earth's surface. Greenhouse gases – carbon dioxide, methane, nitrous oxide, and others – are transparent to certain wavelengths of the sun's radiant energy, allowing them to penetrate deep into the atmosphere or all the way to the Earth's surface. Clouds, ice caps, and particles in the air reflect about 30 percent of this radiation, but oceans and land masses absorb the rest (70 percent of the radiation received from the sun) before releasing it back toward space as infrared radiation. GHG and clouds effectively prevent some of the infrared radiation from escaping; they trap the heat near Earth's surface where it warms the lower atmosphere. If this natural barrier of atmospheric gases were not present, the heat would escape into space, and Earth's average global temperatures could be as much as 61 degrees Fahrenheit cooler¹.

In addition to natural sources, human activities are exerting a major and growing influence on climate by changing the composition of the atmosphere and by modifying the land surface. Particularly, the increased consumption of fossil fuels (natural gas, coal, gasoline, etc.) has substantially increased atmospheric levels of greenhouse gases. Measured, global GHG emissions resulting from human activities, especially the consumption of fossil fuels, have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.² This increase in atmospheric levels of GHG unnaturally enhances the greenhouse effect by trapping more infrared radiation as it rebounds from the Earth's surface and thus trapping more heat near the Earth's surface. Prominent GHGs contributing to the greenhouse effect and climate change include carbon dioxide (CO₂), methane (CH₄), ozone, nitrous oxide (N₂O), and chlorofluorocarbons (CFCs). Emissions of these gases are attributable to human activities associated with the industrial/manufacturing, utilities, transportation, residential, and agricultural sectors.³

The graph below shows projected climate change impacts to California from the high, medium and low emissions scenarios predicted in 2006. It is important to note that more recent indications show that sea level rise is progressing at a significantly faster pace than what is described in this graphic. It is now likely that sea levels will rise by at least 16 inches by 2050 and 55 inches by 2100.

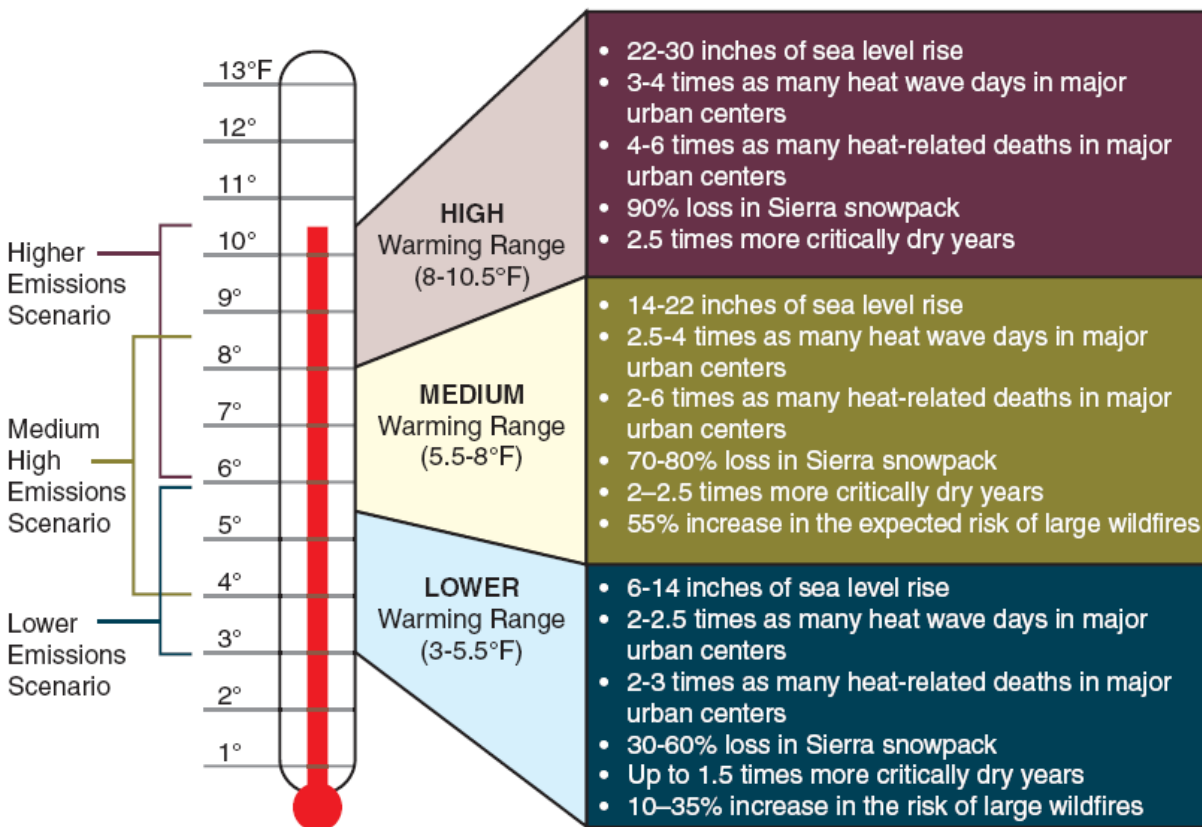
¹ National Aeronautical and Space Administration, "NASA Facts Online," 2007,

http://www.gsfc.nasa.gov/gsfc/service/gallery/fact_sheets/earthsci/green.htm. Accessed June 2007.

² Intergovernmental Panel of Climate Change. National Greenhouse Gas Inventories Programme. <http://www.ipcc-nggip.iges.or.jp/>. Accessed June 2007.

³ California Energy Commission (CEC). "Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 (CEC-600-2006-013)," December 2006.

Figure 3
Projected Global Warming Impact on California
2070-2099 (as compared with 1961-1990)



Source: *Our Changing Climate: Assessing the Risks to California* (2006), www.climatechange.ca.gov

Although used interchangeably, there is a difference between the terms “climate change” and “global warming.” According to the National Academy of Sciences, climate change refers to any significant, measurable change of climate lasting for an extended period. It can be caused by natural factors and human activities alike. Global warming, on the other hand, is an average increase in the temperature of the atmosphere caused by increased greenhouse gas emissions from human activities. The use of the term ‘climate change’ is becoming more prevalent because it encompasses all changes to the climate, not just temperature. Additionally, the term ‘climate change’ conveys temporality, implying that climate change can be slowed or reversed with efforts such as this Plan and efforts of other local, state, national, and world leaders.

Climate change is now a widely accepted fact among scientists with the only uncertainty remaining about how climate change will affect earth's systems over time. Although much of the attention to the topic is global in scale, it is important to realize that climate change affects every community at the local level.

Potential consequences of climate change for the City of San Carlos include:

- ✚ **Rising Sea Levels:** Sea level rise is attributed to the increase of average ocean temperatures and the resulting thermal expansion and the melting of snow and ice contributing to the volume of water held in the oceans. The San Francisco Bay Conservation and Development Commission (BCDC) issued a report on sea level rise in April, 2009, which states that sea levels in the Bay Area will rise 16 inches by mid-century and 55 inches by the end of the century as shown in Figure 4.13-1. By mid-century, approximately 180,000 acres of the Bay Area could be flooded and 213,000 acres could be flooded by the end of the century, including 93 percent of both the Oakland and the San Francisco airports. If anticipated flooding occurs, many communities could experience compromised wastewater treatment and infrastructure failure due to inundation from rising sea levels. The estimated economic value of shoreline development that could be impacted by a 55-inch rise in sea level is \$62 billion. Other anticipated economic impacts relate to movement of goods and people in and around the Bay Area that would be disrupted by flooding of ports, airports, highways, and rail lines.⁴ Research estimates that sea level rise could inundate the entire area east of the Bayshore freeway by 2099 if levees are not built or existing flood control structures are compromised⁵. Additional flooding beyond what seasonally occurs in the eastern areas of San Carlos can also be expected as storm surges will be higher and potentially more forceful due to these factors.
- ✚ **Unpredictable weather:** The years of 1995-2005 had the warmest global temperature ever recorded in instrumental history (since 1850)⁶. Higher temperatures will cause more rainfall than snowfall which will impact water supplies for not only San Carlos, but every other user of water in the State. Combined with longer summer seasons, the increased temperature will reduce soil moisture levels which necessitate increased irrigation, increase the need for air conditioning use, increase the rate and spread of wildfires, and stress the electrical infrastructure that serves the City. Increased flooding due to more intense and less predictable storms, along with sea level rise, will require proactive efforts in order to reduce the potential for damaging coastal flooding and erosion.
- ✚ **Increased rate of wildfires:** Wildfire risk is based on a combination of factors including precipitation, winds, temperature, and vegetation, all of which are susceptible to increased warming. Wildfires are likely to grow in number and size throughout the state as a result of increased temperatures induced by climate

⁴ San Francisco Bay Conservation and Development Commission. 2009. (April) Draft Staff Report. Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline. http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf. Accessed June 5, 2009.

⁵ Knowles, Noah. "Protecting Vulnerability to Inundation Due to Sea Level Rise in the San Francisco Bay and Delta." *Fifth Annual California Climate Change Conference*. PowerPoint presentation. 9 Sept. 2008. <http://www.climatechange.ca.gov/events/2008_conference/presentations/2008-09-09/Noah_Knowles.pdf>

⁶ Rosenzweig, C., G. Casassa, D.J. Karoly, A. Imeson, C. Liu, A. Menzel, S. Rawlins, T.L. Root, B. Seguin, P. Tryjanowski, 2007: Assessment of observed changes and responses in natural and managed systems. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 79-131.

change. Even under the 'medium' warming scenario predicted by the Intergovernmental Panel on Climate Change (IPCC), wildfire risk will likely increase by 55% in California.⁷

- ❏ **Negative impacts on wildlife:** Increased global temperatures and resource depletion exacerbated by climate change is causing disruptions in animal migration and plant pollination. As temperatures rise, species are moving north in California or to higher elevations. This change in migration disrupts the food chain and prevents some plant species from being pollinated. Water and food supplies are expected to be more variable and to shift as the seasons change on different timeframes. With vegetation, reduction in soil moisture will result in early die-back of many plants potentially leading to conflicts with animal breeding seasons and other natural processes. Many of the potential affects on wildlife are still being studied, but due to inability to adapt to new climates, the potential for severe species loss is prescient.
- ❏ **Deteriorating public health:** Heat waves are expected to have a major impact on public health as well as decreasing air quality and an increase in mosquito-breeding and mosquito-borne diseases. Vector control districts throughout the state are already evaluating how they will address the expected changes to California's climate. The elderly and young, and those vulnerable populations that do not have the resources to deal with the costs and adapt to the changes that are expected to impact the community will need assistance. Social equity issues related to the unequal distribution of resources and increased costs to address community wide health risks will need to be addressed proactively to reduce the potential for financial strain on the City.
- ❏ **A decreasing supply of fresh water:** Warmer average global temperatures cause more rainfall than snowfall, making the winter snowfall season shorter and accelerating the rate at which the snow packs melt in the spring. With the City of San Carlos' water supply primarily coming from the Hetch Hetchy reservoir in the Sierra Nevada Mountains, the change to a liquid-precipitation-centric system has the potential to reduce storage capacity, water quality, and the accessibility of water for emergency situations. With rain and snow events becoming less predictable and more variable, this could increase the rate of flooding and decrease the City's ability to maintain fresh water for consumption. Additionally, sea level rise is expected to increase salinity levels of the Sacramento Delta region, which could lead communities currently relying on the Delta for their water supplies to search for alternative sources of potable water, further stressing the Hetch-Hetchy system.
- ❏ **Negative impacts on hydropower:** Numerous utilities manage hydropower facilities in the Sierra Nevada Mountains that are fed by streams and precipitation during the spring season. Increased temperatures from climate change are expected to cause an earlier spring snowmelt runoff and cause more precipitation to fall as rain rather than snow. These two effects may

⁷ California Climate Change Center, Our Changing Climate: Assessing the Risks to California, 2006.
<http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF>. Accessed Dec. 3, 2008.

negatively affect the operation of high elevation hydropower reservoirs due to greater spillage from higher inflows and a timing mismatch between hydropower energy supply and energy demand.⁸

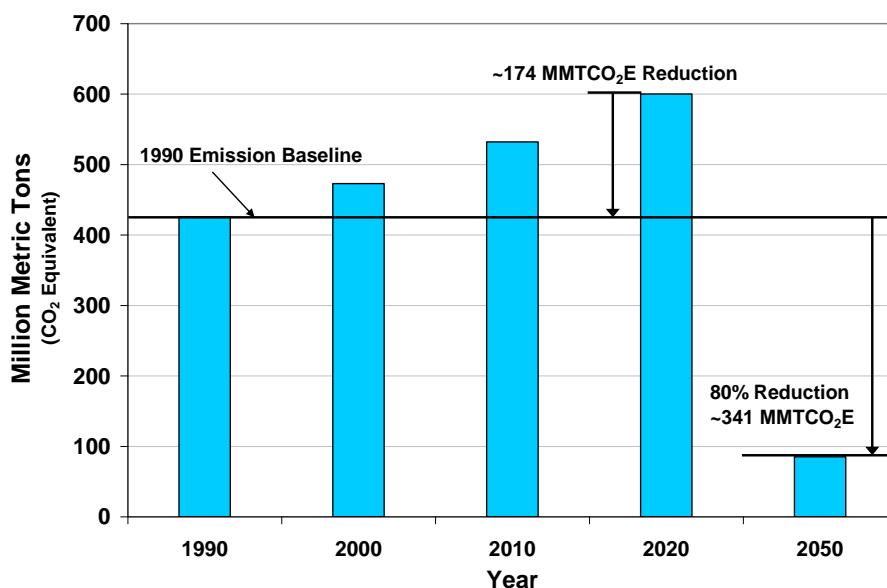
State Initiatives to Combat Climate change

California continues to be a leader in addressing climate change in the United States and in the world. In June of 2005, Governor Schwarzenegger issued a landmark Executive Order establishing progressive greenhouse gas emissions targets for the entire state. Executive Order S-3-05 makes the following goals:

- ✚ By 2010, reduce greenhouse gas emissions to 2000 levels;
- ✚ By 2020 reduce greenhouse gas emissions to 1990 levels;
- ✚ By 2050, reduce greenhouse gas emissions to 80% below 1990 levels.

To support these reduction targets, the California legislature adopted the California Global Warming Solutions Act of 2006, also known as AB 32. The law requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce greenhouse gas emissions to 1990 levels by 2020. In December 2008, CARB approved the AB 32 Scoping Plan outlining regulatory and market mechanisms to achieve the goal of AB 32. The plan cites local government action as an integral partner to achieving the State's goals.

Figure 4
California Climate Change Emissions and Targets



Source: California Air Resources Board

⁸ California Climate Change Center, Climate Change Impacts on High Elevation Hydropower Generation in California's Sierra Nevada: A Case Study in the Upper American River, Dec 2005.
<http://calclimate.berkeley.edu/9%20Climate%20change%20impacts%20on%20high%20elevation%20hydropower.pdf>, accessed November 3, 2008.

AB 32 has caused a ripple effect among cities, counties and environment groups throughout the state. In *State of California Attorney General v. San Bernardino County* in 2007, the California Attorney General's office argued that the Environmental Impact Report for San Bernardino's new general plan did not conform to the overall goals of AB 32 because it did not adequately analyze or mitigate the effects of development on global warming. The County settled with the State by agreeing to produce a greenhouse gas emissions reduction plan much like this report and, at the same time, furthering California's commitment to addressing climate change.

The San Bernardino Settlement Agreement led Senators to write SB 97 in August 2007. This law formally acknowledges that climate change is an important environmental issue that requires analysis under the California Environmental Quality Act (CEQA). The Governor's Office of Planning and Research (OPR) is responsible for developing guidelines for addressing climate change in CEQA documents by 2009. The guidelines will be adopted by the State Resources Agency in 2010.

In September 2008, the Attorney General reached another settlement agreement concerning climate change, this time with the City of Stockton. According to the Attorney General's office and the Sierra Club, the City of Stockton did not adequately address climate change in its 2035 General Plan update and corresponding Environmental Impact Report. The City of Stockton settled with the Attorney General by agreeing to adopt a climate action plan designed to reduce sprawl, increase infill development, promote public transit and encourage more energy-efficient buildings.⁹

Although EO S-3-05, AB 32, SB 97, and the Attorney General's actions have made California a global leader in climate change policy, there is much more to come. Numerous bills concerning energy use, land use, transportation, and other climate change topics have been passed in Sacramento. Some of these bills, like SB 375 passed in September 2008, will result in regional approaches to reducing greenhouse gas emissions.

SB 375 aims to reduce greenhouse gas emissions by linking transportation funding to land use planning. It requires Metropolitan Planning Organizations (MPOs) like MTC to create Sustainable Communities Strategies (SCSs) in their regional transportation plans (RTPs) for the purpose of reducing suburban sprawl. It also creates incentives for implementation of the SCS. Additional efforts are underway to affect the overall transportation sector by mandating fewer emissions from vehicles via AB 1493 (Pavley), signed into law in 2002. The Pavley bill requires car manufacturers to reduce tailpipe emissions from new passenger cars and light trucks; however enforcement of this legislation is awaiting approval by the US EPA.

The scale and pace at which the State of California is addressing this issue is even more of a reason San Carlos as a community should accelerate our efforts to combat climate change.

⁹ California Attorney General's Office, "California Environmental Quality Act – Global Warming," <http://www.ag.ca.gov/globalwarming/ceqa.php>. Accessed October 16, 2008.

San Carlos' Commitment to Sustainability

"The City of San Carlos will work with its residents and businesses as well as in conjunction with neighboring cities, counties, and other agencies interested in this matter to progress on reducing greenhouse gas emissions and to reduce global warming pollution levels."

- The San Carlos Climate Protection Letter:

On May 27, 2008, the City Council adopted the City of San Carlos Climate Protection Letter, establishing the City as an active participant in the fight against climate change. The letter urged federal and state governments to work on reducing their dependence on fossil fuels and to accelerate the development of clean, economical energy resources and fuel efficient technologies. Furthermore, it committed the City to addressing its own footprint through inventorying its emissions and developing this Climate Action Plan in conjunction with the General Plan update.

In August of 2008, the greenhouse gas emissions inventory for the community of San Carlos was released. This report was updated and re-released with updated data and projections in October 2008 and is attached as Appendix C. The inventory began the process outlined by ICLEI in Figure 5 below. The Climate Action Plan Subcommittee accomplished the second milestone by setting an emission reduction target. This Climate Action Plan fulfills the third milestone, which is to create a plan, and examine strategies for implementation, further monitoring, and re-assessments.

Figure 5
ICLEI's Five Milestone Process



In addition to beginning this formal process, San Carlos has already made great strides in making itself more sustainable through city- and citizen-led initiatives. The City of San Carlos was a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative, which today includes all 39 cities and counties in Silicon Valley. The City also provided a Community Solar Discount Program promoted by San Carlos Green, which

aims to inspire a more environmentally conscious and sustainable community. As of June 2009, the City boasts at least 20 certified green businesses with many more in the application phase.

When it comes down to making an actual difference, it is this kind of local action that will shape the future of our planet. In developing this Climate Action Plan, the community of San Carlos is creating reduction measures suited specifically to our population and location.


II. San Carlos' Community Greenhouse Gas Emissions

With the help of Local Governments for Sustainability (ICLEI), San Carlos quantified our community greenhouse gas emissions in August 2008. The inventory acts as a baseline against which we can track our progress in lowering greenhouse gas emissions. It also gives us an understanding of where the highest percentages of emissions are originating, and consequently, where the greatest opportunities for emissions reductions exist.

The community-wide inventory measures greenhouse gas emissions released as a result of activity within the geographic borders of San Carlos in the year 2005. Although there is more recent data available, using a baseline of 2005 allows us to compare and track San Carlos' emissions against those of other Bay Area cities, most of which also use a 2005 baseline. It is hoped that higher emission reductions can take place through regional cooperation and a more standardized approach to addressing greenhouse gas emissions between local governments.

Community-Wide Inventory Methodology

With the exception of transportation emissions, the Inventory was calculated using the Clean Air and Climate Protection (CACP) software developed by ICLEI.¹⁰ Transportation emissions were calculated using methodology contained within the General Plan update.¹¹ This software takes data on electricity and natural gas consumption, vehicle miles traveled, and solid waste tonnage and converts it into carbon dioxide equivalent, or CO₂e, using specific coefficients according to fuel or waste type. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane (CH₄) is twenty-one times more powerful than carbon dioxide on a per weight basis in its capacity to trap heat; so the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents.¹²



How much is a Metric Ton of Carbon Dioxide (CO₂)?

1 metric ton = 2,205 pounds
One pound of CO₂ can fill 120 party balloons. That means that one metric ton of CO₂ could fill more than 250,000 party balloons.

San Carlos does not have any commercial scale power plants or natural gas generators within our city limits, therefore most energy consumed in San Carlos is produced outside of the community and imported into San Carlos. Given this fact, it is still the responsibility of San Carlos to include these greenhouse gas emissions released in another community in this report. Although these emissions are not directly emitted within San Carlos, we still must take ownership over these emissions in order to lower our impact on the region as a whole.

¹⁰ STAPPA/ALAPCO and ICLEI's CACP Version 1.1, June 2005 developed by Torrie Smith Associates.

¹¹ Transportation analysis utilizes VMT numbers from the "City of San Carlos General Plan Traffic Study" prepared for the City of San Carlos by Hexagon Transportation Consultants, Inc., dated May 13, 2009.

¹² The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential, or GWP. For more information on GWP see: IPCC Fourth Assessment Report, Working Group I, Chapter 2, Section 2.10.

Creating this emissions inventory required the collection of information from a variety of sources, including the Pacific Gas and Electric Company (PG&E), the Metropolitan Transportation Commission (MTC), the California Integrated Waste Management Board, Caltrans, Caltrain, and internal City records. Data from the year 2005 was used for the community inventory, with the exception of a subset of the waste data, which utilizes a California statewide waste characterization study conducted in 2003-04.

Community Greenhouse Gas Emissions

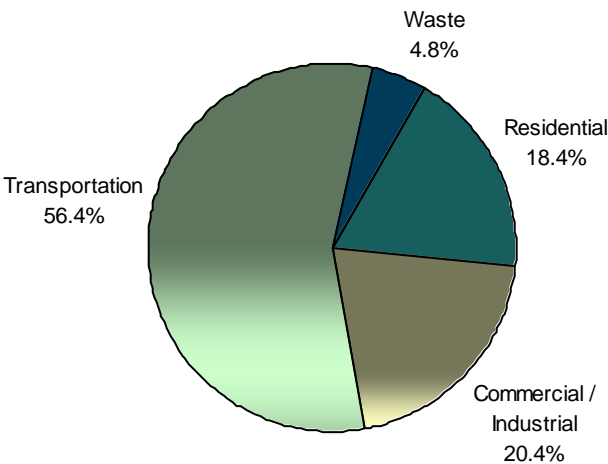
In the base year 2005, the community of San Carlos emitted approximately 267,237 metric tons of CO₂e with the following distribution:

Table 1
City of San Carlos Community Greenhouse
Gas Emissions by Sector, 2005

Sector	Metric tones CO ₂ e	Percent
Residential	49,178	18.4%
Commercial / Industrial /Municipal	54,619	20.4%
Transportation	150,663	56.4%
Waste	12,777	4.8%
Total	267,237	100%

As illustrated in Figure 6 below, the transportation sector was the largest emitter of greenhouse gas emissions, producing 56.4% of the 267,237 metric ton total. The residential sector was the second largest source of emissions with 18.4% of the total. Emissions from the commercial/industrial/municipal sector and waste contributed 20.4% and 4.8% respectively.

Figure 6
Community GHG Emissions by Sector



The community-wide and municipal inventories meet and exceed current best practices; however that does not mean that they are entirely comprehensive. Inventories are currently constrained by privacy laws, data availability, and a lack of reasonable methodology to collect or analyze data. The good news is that greenhouse gas inventorying is a constantly evolving science and practice. As greenhouse gas modeling becomes more widespread and methodology improves, emissions not currently included in San Carlos' baseline inventories will

be added and the reduction goals updated.

Specifically, the greenhouse gas emissions sources not included in the municipal and/or community-wide inventories include the following:

- Aircraft Emissions:** The airport is operated by the County of San Mateo and emissions from the airports operation will be included in the County's municipal emissions inventory in accordance with accepted inventory protocol. In the future, this number will be included as an information item to provide context with other community emissions. A reasonable methodology for calculating aircraft emissions attributed to a local airport did not exist prior to the completion of the Greenhouse Gas Inventory. Some jurisdictions have chosen to quantify aircraft activity below a certain elevation while others have chosen to quantify aircraft emissions within a certain distance of the airport. It is important to note that while aircraft emissions are not included, emissions from electricity consumption and waste production at the airport are included in the community-wide Inventory since we were unable to disaggregate these numbers at the time the inventory was created.
- Sewage Treatment Emissions:** The City is working with other participants in the SBSA to develop a standardized protocol for measures and tracking emissions related to each individual municipality, however a system was not in place at the time of this document's release. Current inventory protocol allocated emissions related to sewage treatment plants to the jurisdiction in which it is located. Further, lack of consistent methodology limits us from accurately calculating emissions from sewage created in San Carlos and treated in the South Bayside System Authority's facilities. Due to a number of differences between the municipalities that operate the System, including water efficiency requirements, impervious surface allowances, landscape irrigation efficiency standards, and type of building stock, it is unclear what portion of the sewage treated at these facilities originates from San Carlos. For these reasons, emissions estimates associated with our share of sewage were not made in this report. In the future, this number will be included as an information item to provide context with other community emissions.
- Water Emissions:** Emissions from the filtration and movement of water consumed in San Carlos are not entirely included in this inventory per standard practice. The filtration, movement, and treatment of water consumed in San Carlos largely takes place outside of the City's boundary. These emissions, therefore, should be accounted for by the jurisdiction that hosts these facilities. Our Inventory does include energy emissions associated with local consumption of water, including City-owned water pumps and household and commercial hot water heaters. Movement of water to San Carlos results in very little energy use and associated emissions since San Carlos's water supply comes from the Hetch Hetchy reservoir, which is gravity fed to the peninsula. In the future, this disaggregated number will be included as an information item to provide context with other community emissions.

- ❏ **Freight and Off-Road Vehicle/Equipment Emissions:** Emissions from freight trains and off-road vehicles traveling within San Carlos are not included in this Inventory. For rail, and other off-road vehicles and equipment emissions, the California Air Resources Board OFFROAD 2007 software provides emissions from rail and port activities, however these numbers are aggregated for the entire San Mateo County area, including incorporated, unincorporated, and State or federally owned land. Without data specific to incorporated area of San Carlos and without a reasonable methodology for allocating the OFFROAD calculation, freight rail activity emissions were omitted. Passenger rail emissions for CalTrain are included due to data availability as a result of rider surveys. Once disaggregated data becomes available, this number will be included as an information item to provide context with other community emissions in future updates to this document.
- ❏ **Propane Emissions:** Lack of data availability prevents the calculation of emissions from propane (liquefied petroleum gas, or LPG) created in the City's boundaries. Propane is an unregulated fuel in California (except for storage and safety issues which are regulated). Because it is an unregulated commodity, no reliable data is collected by the state on propane sales or usage. Once reliable data becomes available, this number will be included to provide context with other community emissions in future updates to this document.
- ❏ **Lifecycle Emissions:** This Inventory does not include lifecycle emissions for the community of San Carlos. Lifecycle emissions are emissions associated with the production and disposal of items consumed by residents and businesses in San Carlos. These are the types of emissions normally included in a 'carbon footprint' but not in a greenhouse gas inventory (see breakout box). For instance, a lifecycle analysis would not only calculate the emissions from vehicular travel within the City, but also emissions associated with the manufacture, fueling, and eventual disposal of vehicles. Since these emissions are difficult to accurately estimate and since they are not in the City's control, lifecycle emissions are not included.

What's the difference between an emissions inventory and a carbon footprint?

An emissions inventory incorporates emissions directly caused by actions taken within the City that we know how to calculate. A carbon footprint, on the other hand, encompasses greenhouse gas emissions from the entire life cycle of a product or service utilized within San Carlos. This could include the emissions from raising beef for sale at the supermarket or the fuel consumption associated with residents' flights out of SFO for vacation. At this time, it is difficult to accurately estimate the community's carbon footprint. However, individuals may reduce their carbon footprint by buying local, reducing packaging, and other behavioral changes.

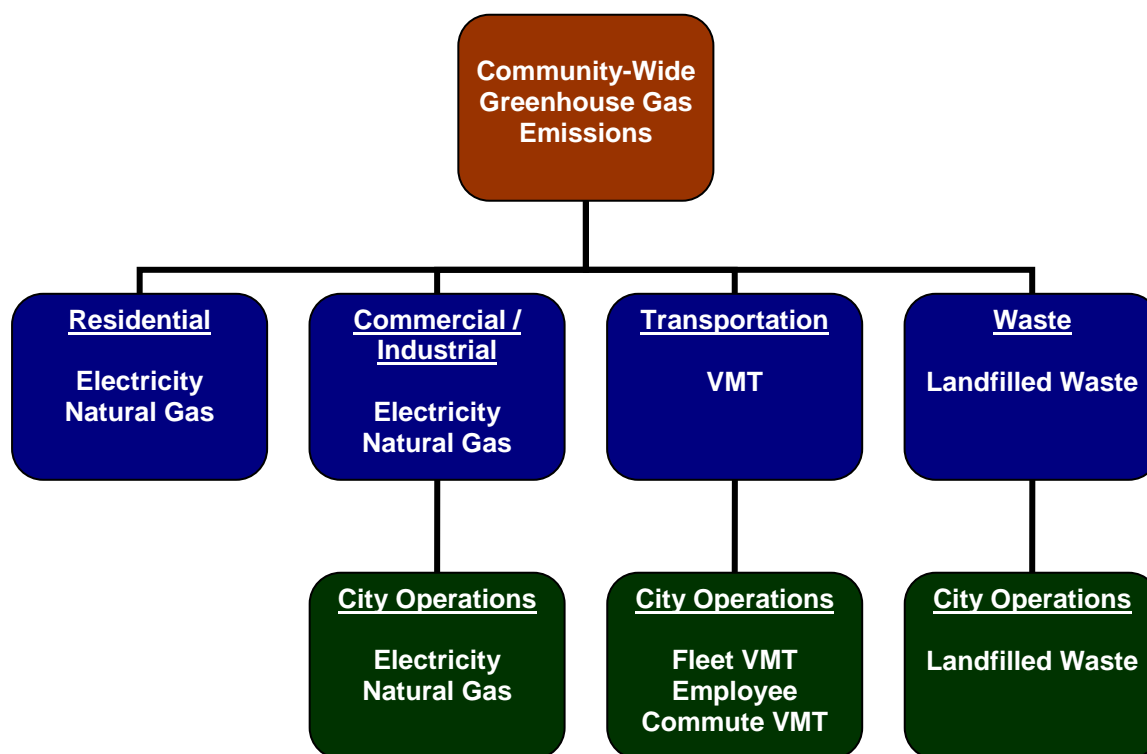
Under these limitations, it is likely that San Carlos' emissions are greater than 267,237 metric tons of CO₂e per year. However, it is important to note that these 267,237 metric tons are primarily greenhouse gases that the community has directly caused and has

the ability to reduce through implementation of this Climate Action Plan and corresponding efforts. Future Greenhouse Gas Inventory data collection efforts will attempt to resolve these data issues and provide additional specificity about emissions. Future inventories will also include emissions using the baseline methodology to allow cross-comparisons of like data.

Municipal Operations Emissions

ICLEI completed the San Carlos Municipal Greenhouse Gas Emissions Inventory ("Municipal Inventory") in August 2009 through a grant from Sustainable Silicon Valley. The Municipal Inventory analyzes greenhouse gas emissions from City operations and facilities, including those from the operation of City offices, fleet vehicles, City-owned water pumps, and more. The Municipal Inventory, like any commercial or household greenhouse gas audit, is a subset of overall community-wide emissions. Since City activities occur within the geopolitical boundary of San Carlos, they are accounted for in the overall community-wide inventory figures. However, the Municipal Inventory is useful in order to delineate which portion of the community-wide Inventory can be attributed to City operations and facilities. The relationship between community and municipal operations is shown below in Figure 7.

Figure 7 – Relationship of Community-Wide and Municipal Greenhouse Gas Inventories



City operations and facilities contributed approximately 1,743 metric tons of greenhouse gas emissions in calendar year 2005. This is approximately 0.6% of total community-wide emissions, which is consistent with other municipalities in California. The majority of City emissions were caused by City employees commuting to and from work.

Figure 8 – Municipal and Community Emissions

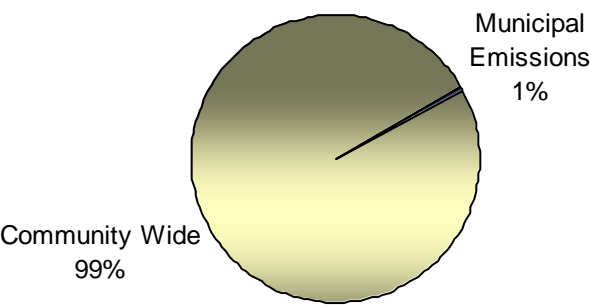


Figure 9 – Municipal Greenhouse Gas Emissions by Sector

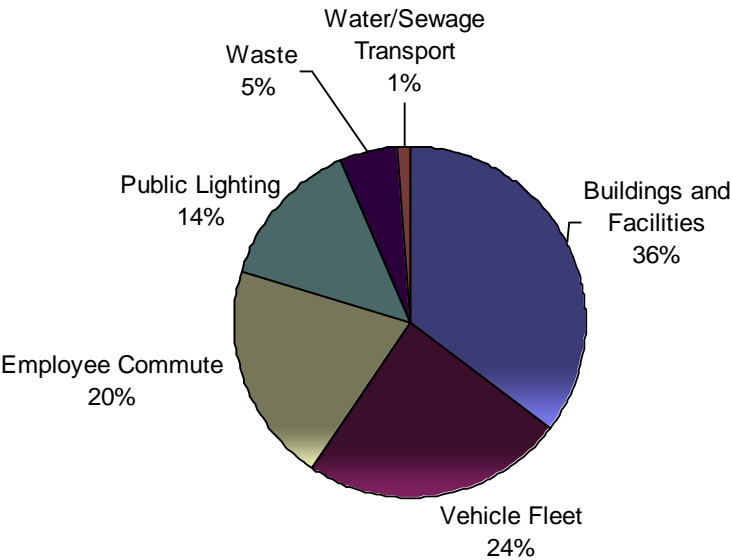


Table 2 – Municipal Greenhouse Gas Emissions

Sector	Metric tons CO ₂ e	Percent
Buildings and Facilities	613	35%
Vehicle Fleet	425	24%
Employee Commute	353	20%
Public Lighting	241	14%
Government-generated Solid Waste	93	5%
Water/Sewage Transport	18	1%
Total	1,743	100%

Discussion: 1990 Greenhouse Gas Emissions

State, Federal, and international targets for greenhouse gas emissions frequently use the year 1990 as a reference point. For instance, AB 32, The California Global Warming Solutions Act of 2006, sets the goal of reducing emissions to 1990 levels by 2020 and to 80% below 1990 levels by 2050. The baseline year of 1990 is thought to be used in AB 32 in order to make it comparable to the Kyoto Protocol of 1992, which commits member nations to reducing emissions by 5.2% below their 1990 baseline by 2012.

Although 1990 is a common reference point for greenhouse gas reductions, it is difficult to calculate a level of CO₂ equivalent from that time when no previous analysis has been made. The current methodology for estimating 1990 levels, called “back-casting,” calculates 1990 emissions levels based on current levels of CO₂e and adjusted for 1990 population and job statistics. Back-casting is a very indefinite science; not only does it not take into account changes in consumption and efficiency, but it relies heavily upon finding reliable data from almost two decades ago.

While it would be beneficial to have parallel reference points for all emissions reductions goals, we believe it is better to use an accurate baseline rather than an estimate of 1990 levels. As a result, this Climate Action Plan for the City of San Carlos will not attempt to back-cast to 1990 levels. This decision is supported by ICLEI, which has stated that back-casting to 1990 is too unreliable to base any sort of reduction target upon. In order to maintain consistency with other Bay Area cities and to provide a reliable emissions estimate, this Plan uses a baseline year of 2005 instead of 1990. Our interim reduction goal of 15% below 2005 levels by 2020 is confirmed by the California Attorney General and California Air Resources Board to be equivalent to reducing emissions to 1990 levels by 2020 as outlined in AB 32.

Although 1990 back-casts from 2005 emissions levels are not accurate, a rough approximation of San Carlos' 1990 emission levels were calculated as solely an information item for decision makers and the community. This estimate is based on population and household growth rates in the City of San Carlos and in the County of San Mateo. An estimate of decreased waste recycling was also factored in. This estimate does not take into account changes in energy generation efficiency, consumer behavior, or vehicle efficiency. Under these conditions, it is estimated that the community of San Carlos emitted 213,605 metric tons of CO₂e in 1990. This results in an estimate of increased emissions of 8.5% between 1990 and 2005.

San Carlos's Greenhouse Gas Emissions Forecast

If the community of San Carlos continues with the 2005 pattern of energy consumption, travel, and waste production, the rate of greenhouse gas emissions is estimated to increase to 321,519 metric tons of CO₂e per year by 2020 and 365,787 metric tons of CO₂e per year by 2030. These “business as usual” forecasts are 20.3% and 36.9% higher than 2005 levels, respectively, due to General Plan buildout estimates of population, household, and job growth.

2030 General Analysis	Plan Buildout	
	2005	2030
Jobs	15,560	28,453
Population	28,200	32,303
Households	11,710	13,396

The 2020 and 2030 forecast estimates included in this Plan are based on analysis performed as part of the General Plan update. The job, household, and population growth rates are based on buildout of the preferred growth scenario of the General Plan. It is therefore likely that development and emissions will not increase to this level.

Figure 10
2030 Emissions Forecast

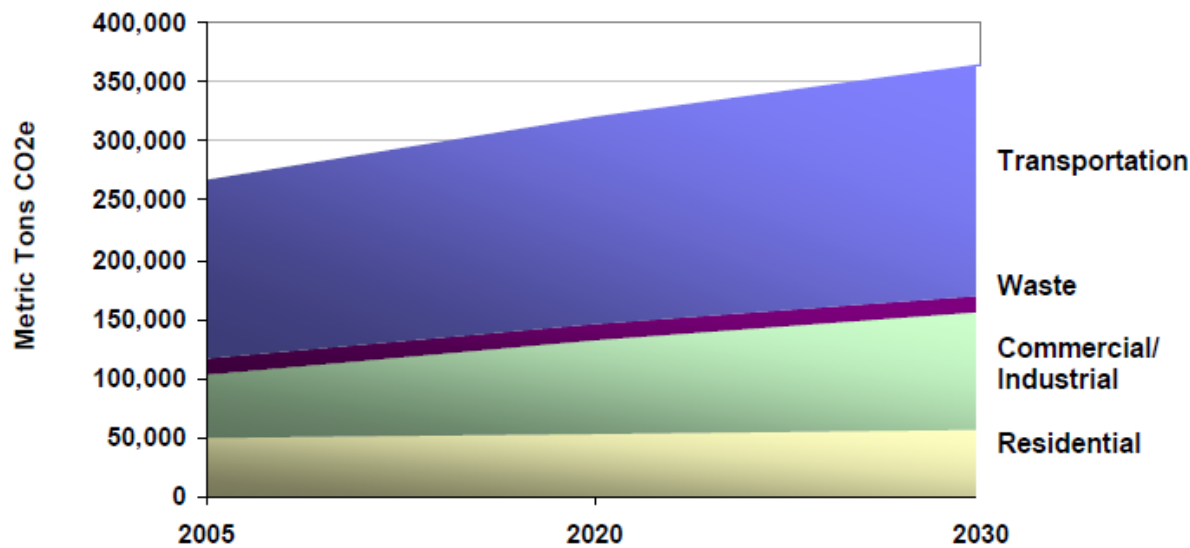


Table 3
Emissions Forecast for 2020 and 2030 by Sector

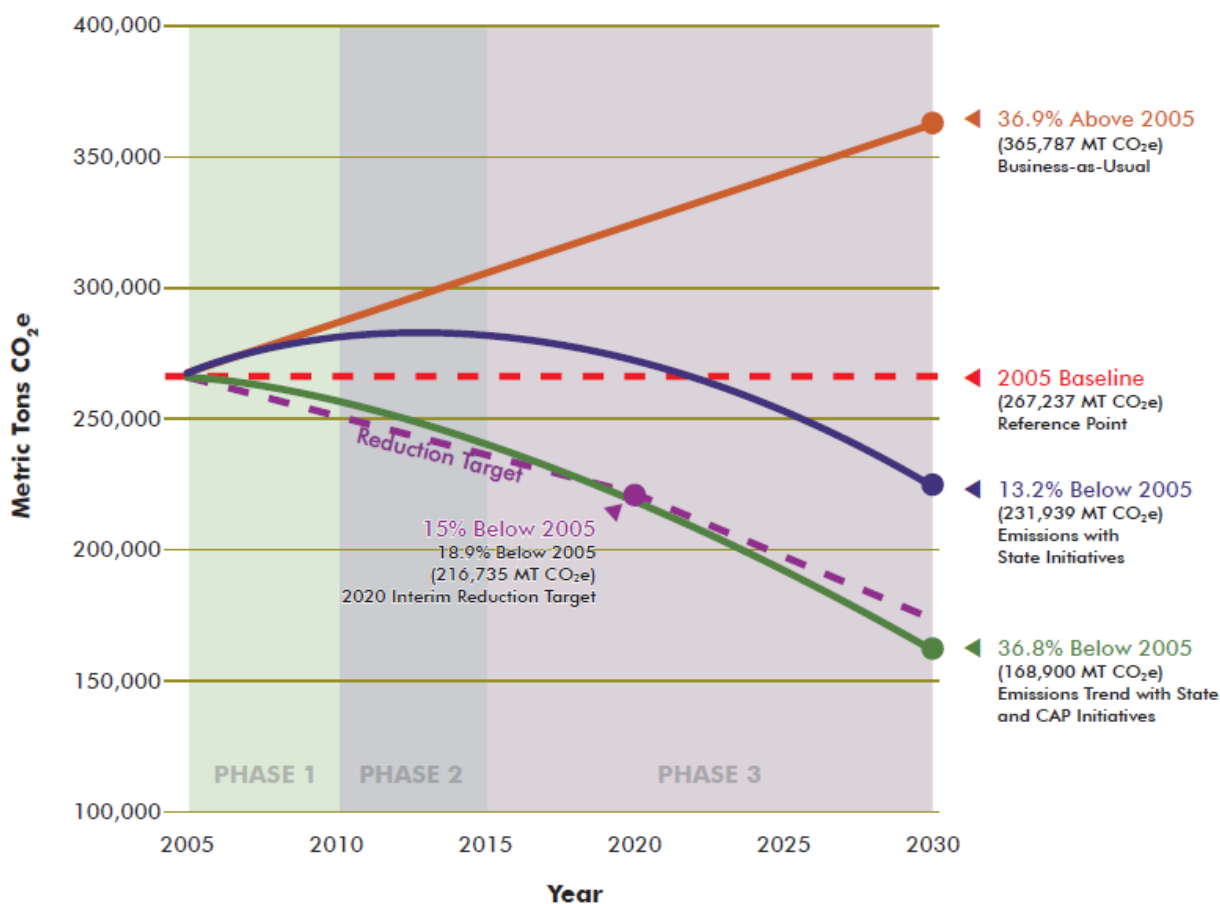
2005 Community Emissions Growth Forecast by Sector	2005	2020	2030	Annual Growth Rate	Percent Change from 2005 to 2020	Percent Change from 2005 to 2030
Residential	49,178	53,312	56,259	0.540%	8.4%	14.4%
Commercial / Industrial	54,619	78,454	99,876	2.444%	43.6%	82.9%
Transportation	150,663	175,891	195,016	1.037%	16.7%	29.4%
Waste	12,777	13,862	14,636	0.545%	8.5%	14.5%
TOTAL	267,237	321,519	365,787	--	20.3%	36.9%

San Carlos' Greenhouse Gas Reduction Target

In order to achieve San Carlos' reduction target of 35% by 2030, total emissions within San Carlos would need to lower to 133,679 metric tons per year. That is 63.5% change from the 2030 business-as-usual projection.

It is important to focus on the sectors that will exhibit the greatest projected increase in emissions. As shown in Table 2 and illustrated in Figure 8 above, the greenhouse gas emissions from transportation and commercial / industrial activity are projected to increase at higher rates than the residential and waste sectors. In this Climate Action Plan, the transportation and commercial / industrial sectors will be given greater attention.

Figure 11
2030 Emissions Reductions In San Carlos



This graph and the individual reduction scenarios will be explained thoroughly in the reduction target analysis chapter, however it is important to be aware at the onset that the reduction measures included in this Plan will be implemented throughout time and that there may be different degrees of effectiveness depending upon State and regional programs. As shown through the lower green line above, we expect our 35% reduction target to be achieved through a combination of the reduction measures included in this Plan and State initiatives as explained later in this document.

III. Achieving San Carlos' Reduction Target

In June 2008, the San Carlos General Plan Advisory Committee (GPAC) formed the Climate Action Plan (CAP) Subcommittee and charged them with performing the in-depth analysis needed for a Climate Action Plan. In August 2008, using the information from the baseline Greenhouse Gas Inventory as a guide, the Subcommittee developed a Strategic Policy Focus to guide the development of the Climate Action Plan and associated emissions measures. This Policy Focus highlights those emission sources that would have the greatest impact on reducing emissions within the City. Throughout the Climate Action Plan development process, the CAP Subcommittee was responsible for reviewing and analyzing strategies consistent with this policy focus and aimed at reducing greenhouse gas emissions.

Over 100 strategies were initially considered by the Subcommittee. This list was reduced and modified during several Subcommittee meetings and at a community workshop on September 25, 2008. Workshop participants discussed the proposed reduction measures and provided their thoughts on which were most effective for the unique community of San Carlos. The public workshop comments, along with emails, public comment, and City staff input, culminated in the 21 reduction measures analyzed in this report.

**San Carlos Climate Action Plan
Strategic Policy Focus:**

- 1. Building Efficiency/Site Design
- 2. Auto Emission Reduction
- 3. Low Carbon Energy Use
- 4. Alternative, Non-Automotive Travel Modes
- 5. Waste Reduction Program

Community participation is essential in the development of a Climate Action Plan because, in the end, it is the people of San Carlos who will drive change and make the sacrifices necessary to reduce emissions. Developing and implementing the measures included in this Plan will require continuous effort and collaboration among businesses, residents, and the City.

Structure

San Carlos' 21 reduction measures are separated into three chapters for analysis: Energy, Transportation and Land Use, and Solid waste. Each reduction measure has its own greenhouse gas reduction goal and is supported by one or more components. The reduction goal of each measure is based on current knowledge and science. If for some reason science, technology, or politics change in the future, the components of each reduction measure can be modified or added to as long as the total greenhouse gas reduction adds up to that measure's goal. This structure of tying the reduction target to the measure rather than the measure's individual components will allow for flexibility and will ensure that San Carlos meets, if not exceeds, our overall reduction target of 35%.

The components of each reduction measure have the following structure:

- Description: A short description of the overall goal of the reduction measure.
- Initial cost analysis: An estimate of initial cost to the City of San Carlos for implementing each individual component and the methodology used to calculate this estimate. Costs included in the estimate are mostly for staff time and for materials such as trees or hybrid vehicles. Costs are not adjusted based on planned implementation timeline.
- Emissions reductions analysis: An estimate of the reduction in greenhouse gas emissions caused by the component. The emission reduction is provided in metric tons of CO₂ equivalent (CO₂e).

Finally, the end of each chapter includes a discussion of San Carlos's activity to date in achieving our reduction target. This includes an estimate of where San Carlos currently stands in reducing emissions to the level outlined in each chapter.

Methodology: Initial Cost analysis

Each reduction measure includes an estimate of initial cost to the City based on current research, case studies, and the experience of City staff. These estimates are non-amortized approximations of first-year costs to the City for Staff time and materials. Although a payback analysis is possible for some measures, only the initial costs were calculated to maintain consistency. For instance, while it is relatively easy to calculate a payback and internal rate of return for hybrid car purchases, it is difficult to calculate a payback for bicycle-friendly intersections.

In the summary table of each measure, the cost per metric ton of CO₂e reduction is calculated. Although this is a good estimate of value to use for comparison, it is important to consider rates of return, social factors, and City preference when comparing reduction measures. The initial costs can be updated as more information is available. Appendix A provides detailed methodology and assumptions for the initial cost analysis of each measure.

Methodology: Greenhouse Gas Emissions Reductions Analysis

The emissions reductions estimate for each measure uses the Climate and Air Pollution Planning Assistant (CAPPA) tool developed by ICLEI. The tool was created to assist local governments in developing customized plans for reducing climate change. CAPPA provides information and quantification tools for over 100 emission reduction strategies in its current form. City-specific data is entered into the CAPPA software and combined with emission coefficients and current research. Where a CAPPA reduction analysis wasn't applicable, current research and City data was compiled to create an estimate or to display that an estimate is not currently possible. Appendix B details the sources and input data for the estimates of greenhouse gas emissions reductions. Appendix B provides detailed methodology and assumptions for the greenhouse gas emissions reductions analysis of each measure.

IV. Energy Use Strategies

The 2005 baseline inventory reveals that the second largest contributor to San Carlos' greenhouse gas emissions (38.8%) comes from residential, commercial, municipal, and industrial energy use in San Carlos. Natural gas accounts for 48.3% of energy-related emissions while electricity accounts for 51.7%. The energy we consume in our homes contributes about half of the greenhouse gas emissions from electricity and natural gas while commercial/industrial/municipal properties contribute the other half. If energy consumption continues as usual, we can expect these emissions from the residential, commercial, industrial, and government sectors to increase 50% by 2030.

Table 4
Energy use “business-as-usual” projected emissions growth (CO₂e per year)

Sector	2005	2020	2030	Percent change from 2005 to 2030
Residential	49,178	53,312	56,259	14.4%
Commercial / Industrial / Municipal	54,619	78,454	99,876	82.9%
Total	103,797	131,766	156,135	50.4%

To address this significant cause of greenhouse gas emissions within San Carlos, reduction measures were formed by the Climate Action Plan Subcommittee and City staff. The measures to reduce greenhouse gas emissions from energy use in San Carlos are as follows:

1. Expand energy saving opportunities to businesses.
2. Improve residential energy efficiency.
3. Adopt a green building standard for new development and major remodels.
4. Create water and waste efficient landscapes.
5. Identify opportunities for on-site renewable energy generation on City and privately-owned property.
6. Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.
7. Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.
8. Encourage tree planting

Even without the implementation of these measures, energy efficiency is expected to increase in the coming years. Recent state legislation will likely require energy efficiency

improvements on new buildings beginning in 2010 through the State's Green Building Code and improvements to Title 24. Additionally, the State has a renewable portfolio standard with a goal of obtaining at least 33% of the State's electricity from renewable power by 2020 and 50% by 2030. These reductions are analyzed more in Chapter 7.

1. Expand energy saving opportunities to businesses

**-13,300
Metric
Tons Co2e**

Commercial and industrial businesses account for 20.4% of the greenhouse gases in San Carlos. Many of these businesses, especially small businesses, lack the resources and time to promote energy efficiency. This measure would facilitate outreach to businesses and offer them assistance or incentives to become more efficient.

1.1. Consider Developing a Tax Rebate Program for Efficiency Improvements in Businesses

Although energy efficiency improvements usually pay for themselves in the long run, they can be costly at the onset. A financial incentive for improving energy efficiency would attract the attention of more businesses in San Carlos. Rebates would also help with initial costs of upgrades, which are often the greatest deterrent to energy efficiency improvements.

Initial Cost

An initial cost estimate for a tax rebate program cannot be made until a more specific scope for the program is developed. Under the City's current financial situation, it is unclear how much the City will be able to invest in such a program. However, long term feasibility is possible and is the reason this implementation strategy is categorized as a long term program rather than something that should be explored immediately. As other similar tax rebate programs are implemented throughout the state, viability of the program in San Carlos will likely become clearer.

Greenhouse Gas Emissions Reductions

An estimate of emissions reductions from this measure cannot be made until there are case studies or research findings upon which to base an estimate. To date, no California cities have offered property tax or business tax rebates for efficiency improvements, therefore an analysis outside of the scope of this Plan would be needed to determine market receptiveness to a tax rebate program in conjunction with rebates already provided by PG&E and the State.¹³

1.2. Expand Energy Saving Opportunities and Assistance for Large and Small Commercial and Industrial Businesses

Businesses are already feeling the burden of increased fuel and electricity costs. PG&E and RecycleWorks have services to help these businesses, but it would be beneficial to have a City staff person to make sure businesses are up-to-date and aware of current services, information, and rebates.

¹³ The State of California Solar Initiative offers property tax exceptions for solar panel installation.

Small businesses in particular are in need of energy efficiency assistance as they often lack time and capital to make such an investment. An example of a program targeted at small businesses is the City of Berkeley and the City of Oakland Smart Lights program, which provides businesses with hands-on assistance in assessing lighting needs and installing high-quality, energy-efficient appliances. Through the program, small businesses have reduced energy costs by 20-50% and improved lighting quality. Most of the participating businesses recover their costs in less than one or two years. Their program has also saved 3.5 million kWh of energy, \$580,000, and 850 tons of CO₂e over five years.¹⁴

Initial Cost

Providing outreach and assistance to businesses in San Carlos would be relatively easy due to the fact that PG&E, RecycleWorks, the City, and the County already have existing resources and programs for businesses to become more energy efficient. For instance, the City of San Carlos and County of San Mateo already participate in the Bay Area Green Business program.

Utility providers, other agencies, and businesses would be bearing the cost of improving energy efficiency in businesses. The cost of facilitation to the City is estimated to be approximately 50 hours of staff time per year or \$2,500-\$5,000 depending on Staff pay rate.



Green Business Program Success Story:

A+ Japanese Auto Repair

A+ Japanese Auto Repair in San Carlos was the first Green Certified Auto Repair facility in San Mateo County. The repair shop saw improvements in just the first 12 months since receiving Green Business certification such as:

- ✚ The facility now uses 15 recycling bins from paper, plastic, aluminum, and other metals and plastics. As a result, the shop has downsized its garbage bin from a 600 gallon bin to a 45 gallon bin.
- ✚ Energy and water cost savings have already paid for the installation of high-efficiency fluorescent ballasts and bulbs and low-flow water appliances.
- ✚ All engine oil, transmission oil, antifreeze, and other harmful substances are picked up by waste recyclers to be used in other products and services.

Based on these changes and others, A+ Japanese Auto Repair has cut its environmental impact by approximately 65%!

¹⁴ City of Berkeley Draft Climate Action Plan, www.berkeleyclimateaction.org, accessed September 5, 2008.

Greenhouse Gas Emissions Reductions

According to the San Carlos Chamber of Commerce, there are 2,100 businesses in San Carlos. Assuming that 1,000 (50%) of existing businesses and new businesses respond to and participate in energy efficiency outreach, it is estimated that emissions will reduce by at least 13,300 metric tons of CO₂e per year by 2030.

Table 5
Summary of Energy Use Reduction Measure 1

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Consider developing a tax rebate program for efficiency improvements in businesses.	Unknown	Unknown	N/A
2	Expand energy saving opportunities and assistance for large and small commercial and industrial businesses.	\$2,500-\$5,000	13,300	\$0.18 - \$0.38
TOTAL		\$2,500-\$5,000	13,300	\$0.18-\$0.38

2. Improve residential energy efficiency

**-14,115
Metric
Tons Co2e**

The residential sector accounts for 18.4% of greenhouse gas emissions in San Carlos. This measure calls for multiple programs and requirements to reduce this significant contribution to our baseline.

Residents can take simple measures in their homes to save energy like buying efficient appliances, insulating, sealing leaks, adjusting the thermostat, and installing a hot water blanket. Outreach programs and City requirements would offer this information and, in some cases, create incentives for conservation.

2.1. Establish energy efficiency standards for new construction and remodel projects that exceed the State's 2008 Title 24 energy standards

All new construction and additions in California have been required to meet minimum energy efficiency standards since 1978. These standards, along with those for energy efficient appliances, have saved more than \$56 billion in electricity and natural gas costs.¹⁵

California's Title 24 revised energy standards



¹⁵ California Energy Commission. 2009. <http://www.energy.ca.gov/title24>.

were updated in 2008 and go into effect January 1, 2010. The new standard is intended to increase the energy efficiency of retrofits, renovations, and new construction 15% to 20% over 2005 Title 24 requirements depending on the building type and energy type.

The 2008 California Green Building Standards Code (CALGreen) includes 'reach' standards for new buildings that go beyond mandatory requirements. Tier 1 is approximately 15% above Title 24 and Tier 2 is 30% above Title 24. Tier 1 and 2 will be used in upcoming years as eligibility criteria for California's Go Solar initiative, future green building standards, and more.

Under this reduction measure, the City would mandate that new construction be built to Tier 1 Title 24 standard before it is required by the State. This approach to regulation allows the applicants to choose where their energy savings will come from, and as a result accommodates multiple building types and construction methods without restricting the applicants' choices about materials. This will ease implementation of California's goal to make new residential development zero net energy by 2020, which would require a 45% increase in efficiency over 2008 Title 24 mandates. This reduction measure also requires that San Carlos enforce a Tier 2 Title 24 standard to new construction by 2020, a level which will most likely be required by the State regardless of local action.

Initial Cost

It is estimated that writing energy efficiency standards for new construction and remodel projects would cost approximately 100 hours of Staff time, which equates to approximately \$10,000. There will be additional costs associated with staff time needed for plan checks; however this cost will be absorbed by the applicant.

Greenhouse Gas Emissions Reductions

More stringent Title 24 standards are expected to save approximately 4,184 metric tons CO₂e by 2020 and 10,732 metric tons CO₂e by 2030. This reduction is based on an impact study by the California Energy Commission and San Carlos's project emissions growth in these time periods.

2.2. Perform energy-efficient lighting retrofits and/or home energy audits

Home energy audits are an effective way to educate residents on energy efficiency in a hands-on manner. The Cities of Menlo Park, Redwood City, Palo Alto, and Sunnyvale participate in the Green@Home project, a service run by the nonprofit organization Acterra. The organization offers free home energy audits performed by trained volunteers from the community.¹⁶

San Carlos could consider partnering with Acterra or a similar organization to coordinate home energy audits. Conversely, it could work with community groups to coordinate efforts independent of a third party. Either way, home energy audits are especially effective in lowering consumption in homes built before the Title 24 standards came into effect in 1978.

¹⁶ Acterra, Green@Home. <http://www.acterra.org/greenathome/index.html>. Accessed October 13, 2008.

Initial Cost

The cost of this measure depends on whether the home energy audits are coordinated by a non-profit organization like Acterra or by community groups. The cost of enlisting the services of Acterra would be approximately \$35,000 for 250 two-hour home energy audits. On the other hand, costs to the City for a home energy audit program run by community groups would be negligible. We therefore assume that this reduction measure will have costs anywhere from \$0 - \$35,000.

Greenhouse Gas Emissions Reductions

According to the Home Energy Saver calculator developed by the Lawrence Berkeley National Laboratory, the difference between an efficient and inefficient home in San Carlos is approximately 2,400 kilowatt-hours (kWh) of electricity and 445 therms of natural gas per year.¹⁷ Assuming that an energy auditing program serves at least 500 existing homes before 2030, we can estimate that energy consumption in San Carlos would decrease by 600,000 kWh and 111,250 therms per year by 2020 and 1,200,000 kWh and 222,500 therms per year by 2030.¹⁸ Converting this figure into CO₂e, it is estimated that home energy audits will reduce emissions by 1,452 metric tons per year.

2.3. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market

Subsidized devices are already readily available, but more education and outreach is needed about these opportunities. This reduction measure would call for 10,000 CFLs, 500 low-flow showerheads, and 500 faucet aerators to be distributed to the community before 2020 and again between 2020 and 2030. These distributions are in addition to the home energy audit reduction measure. The devices would be distributed through weatherization programs, community events, and targeted outreach.

Initial Cost

The cost of distributing free or subsidized energy and water saving devices and services is minimal assuming that supplies are provided as they have been historically by utility providers and through promotions.

Greenhouse Gas Emissions Reductions

This reduction measure would reduce energy consumption associated with lighting and with water filtration, movement, and heating. Specifically, this reduction measure would reduce greenhouse gas emissions from the following sources in the following ways:

- Compact Fluorescent Lightbulbs (CFLs): Each CFL saves an average of 44 kWh per year when replacing traditional incandescent bulbs.¹⁹ We estimate that 10,000 incandescent lightbulbs will be replaced with CFLs by 2020 and 10,000

¹⁷ Lawrence Berkeley Laboratory Home Energy Saver. <http://hes.lbl.gov/>, Session ID# 1260074, accessed January 2009.

¹⁸ Assumes 250 energy audits before 2020 and 250 additional audits before 2030.

¹⁹ ICLC CAPPA software estimates 44 kWh a year in savings based on replacing half 100watt and half 60w incandescent bulbs with 25w and 15w cfls respectively (i.e. avg 80w replaced with avg 20w, for 60w per bulb savings). Assumes each bulb is on 2 hours per day, which is average for residential lights according to National Lighting Inventory and Energy Consumption Estimate 2002. http://www.eere.energy.gov/buildings/info/documents/pdfs/lmc_vol1_final.pdf.
60w x 2hours/day x 365 days/year = 44 kWh/year

more incandescent lightbulbs will be replaced with CFLs by 2030. Assuming that CFLs continue to be used after initial replacement, we can estimate that energy consumption will reduce by 440,000 kWh per year. This is equivalent to 93 metric tons of CO₂e per year.

❏ **Low-flow showerheads:** Low-flow showerheads save energy associated with water filtration, movement, and heating. Assuming that 1,000 low-flow showerheads are distributed and used, this reduction measure could save 66 metric tons of CO₂e per year from the filtration, movement, and treatment of water. However, since energy for these purposes is not included in the baseline 2005 inventory, this reduction is provided as an information item only. Low-flow showerheads also save energy because they require less water to be heated. Assuming that 42 percent of San Carlos residents use electric water heaters and the rest use gas, this reduction measure would result in an additional reduction of 66 metric tons CO₂e per year. Since energy for heating water within homes is included in the 2005 baseline, this figure will be included in the analysis of San Carlos' total reductions.

❏ **Low-flow faucets:** Low-flow faucets, much like showerheads, save energy associated with water filtration, movement, and heating. As an information item, 1,000 low-flow faucets would save 6 metric tons of CO₂e per year from water filtration, movement, and treatment. In addition, this measure would save 12 metric tons of CO₂e from less water having to be heated. As described above, only the emissions reductions associated with in-home heating of the water will be included in the total of San Carlos' reductions.

CFLs, low-flow showerheads, and low-flow faucets together save an estimated 243 metric tons of CO₂e per year, 171 metric tons of which will be included in the final analysis of San Carlos' reductions.

2.4. Expand and better integrate programs that increase energy efficiency in low-income households

This measure will help to ensure that residents have the ability to respond to climate change equally. Low-income weatherization programs are often win-win situations; the City lowers its greenhouse gas emissions and the low-income resident saves money on their energy bill.

Initial Cost

The Federal Low-Income Household Energy Assistance Program (LI-HEAP) distributes funding for low-income weatherization services as does the U.S. Department of Energy and PG&E. It is likely that some coordination time from City staff would be necessary to determine applicant eligibility however this time is negligible and would most likely be covered by grants.

Greenhouse Gas Emissions Reductions

Based on studies of similar low-income weatherization programs, it is estimated that this reduction measure will save approximately 1,760 metric tons of CO₂e per year, assuming that 1,000 homes are served before 2030.

Table 6
Summary of Energy Use Reduction Measure 2

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Consider establishing energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards.	\$10,000	10,732	\$0.93
2	Perform energy-efficient lighting retrofits and/or home energy audits.	Negligible - \$35,000.	1,452	\$0 - \$24.10
3	Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	Negligible	171	Negligible
4	Expand and better integrate programs that increase energy efficiency in low-income households.	Negligible	1,760	Negligible
TOTAL		\$10,000 - \$45,000	14,115	\$0.93 - \$25.03

3. Adopt a green building standard for new development and major remodels

**-11.868
Metric
Tons Co2e**

"Green Building" is defined as a whole-systems approach to the design, construction, and operation of buildings that helps mitigate the environmental, economic, and health impacts of buildings. Green building practices recognize the relationship between natural and built environments and seek to minimize the use of energy, water, and other natural resources and provide a healthy productive indoor environment. There are multiple organizations that offer green building certification including Build It Green's GreenPoint Rated system (GreenPoint) and Leadership in Energy and Environmental Design (LEED). In addition, the California Building Standards Commission has adopted a green building code for new development. In October 2003, the State of California released an in-depth analysis called *The Costs and Financial Benefits of Green Buildings*, which presented a



comprehensive study on the cost benefits of green buildings and concluded that the financial upside exceeds the cost by a factor of ten-to-one.²⁰

This measure would enforce a green building standard for new construction or major remodels in the City of San Carlos. There are many standards to choose from, including the GreenPoint rating system, LEED, the State, or a customized green building checklist created by City staff. Municipalities often choose a combination of standards. For instance, for buildings in unincorporated areas, the County of San Mateo requires GreenPoint or LEED certification for new residential construction and 50% remodels and requires LEED certification for new commercial construction and remodels over 3,000 square feet²¹. On the other hand, the City of San Mateo has implemented a voluntary Green Building ordinance in order to consider making the program mandatory after one year.

The Climate Action Plan explored two alternative methods of achieving this reduction measure: 1) Enforce the mandatory California Green Building Standard Code (CALGreen) and provide information and support to developers on LEED and GreenPoint standards, analyzed in Appendices A and B as Energy Use measure 3.1A OR 2) Create a green building ordinance requiring a GreenPoint, LEED, or equivalent green building certification per development category, analyzed in Appendices A and B as Energy Use measure 3.1B. Based on the City Council adoption of the Climate Action Plan on October 12, 2009 by Resolution 2009-080, Energy Use measure 3.1B is the selected alternative.

Implementation of a green building standard would include providing additional training for zoning and building staff to enable them to assist developers with their green building requirements. Adequate training for staff will save developers time and maintain the City of San Carlos as a convenient place to do business.

Green Building Success Story: Santa Rosa BIG

The City of Santa Rosa launched its Santa Rosa Build It Green (SR BIG) program in 2003. A voluntary program, SR BIG promotes building and remodeling homes in a way that reduces energy demands, releases far fewer pollutants into the atmosphere, conserves water and reduces construction waste. The program follows a set of simple but comprehensive Green Building Guidelines that provide a roadmap for building design and construction. SR BIG-certified homes look like any other home, and include large custom homes, production subdivision homes, affordable homes (built by Habitat for Humanity) and municipal remodeled dwellings, such as the Santa Rosa Samuel Jones Hall Homeless Shelter. An SR BIG home is at least 11 percent more energy efficient than a conventional new home and is commensurately less expensive to heat, cool and operate.



Source: <http://www.cacities.org/index.jsp?zone=wcm&previewStory=26804>

²⁰ Kats, Greg. The Costs and Financial Benefits of Green Buildings, October 2003. <http://www.usgbc.org/Docs/News/News477.pdf>

²¹ San Mateo County Ordinance No. 04411, February 26, 2008.

3.1A. Enforce mandatory and encourage voluntary actions under the California Green Building Standards Code (as amended) in addition to continuing support to developers on LEED and GreenPoint standards

This reduction measure is currently the standard in San Carlos. It calls for the promotion of LEED and GreenPoint standards in addition to enforcing and supporting the California Green Building Standard Code (CALGreen). CALGreen is the first state-wide green building standard in the country and contains both mandatory and voluntary green-building measures that address areas such as energy efficiency, water consumption, dual-plumbing systems for potable and recyclable water, diversion of construction waste from landfills, and use of environmentally sensitive materials in construction and design (including eco-friendly flooring, carpeting, low VOC paint, adhesives, thermal insulation and acoustical wall and ceiling panels).²² Code requirements are currently voluntary and become mandatory on January 1, 2011.

The majority of the benefits from this measure are included or superseded by Energy Use Measure 2.1 and Waste Measure 3.1. With implementation of measure 3.1B, measure 3.1A would no longer apply. This reduction measure calls for increased outreach by planners and City staff, which has already started. This increased outreach would leverage training and communication already required by the mandatory code enforcement to support voluntary Code measures, LEED certification, GreenPoint certification, and other certification programs as appropriate.

Initial Cost

The initial costs for implementation of this measure include City staff training and additional staff time. The cost of training five City staff members in green building would be approximately \$1,000 for materials and 40 hours of Staff time. However, since this training is mandatory under State law, it will not be considered a cost under this reduction measure. Additional time for promoting LEED, GreenPoint, and other certifications would be equivalent to the level of promotion already taken at City Hall. Therefore, additional costs from this reduction measure are negligible.

Greenhouse Gas Emissions Reduction

Much of the energy and greenhouse gas savings from this measure are captured in Energy Use Measure 2.1, which calls for establishing energy efficiency standards above the CALGreen requirements. Additional greenhouse gas reductions are included in Solid Waste Measure 3.1, which calls for increased construction and demolition diversion requirements. It is estimated that promotion of voluntary Code requirements and promotion of LEED/GreenPoint certification would lower energy consumption in new development and remodels by an estimated 5%. These savings would lower greenhouse gas emissions from the built environment by roughly 466 metric tons of CO₂e per year by 2020 and 535.5 metric tons per year by 2030.



²² California Building Standards Commission, *California Green Building Standards Code*, Effective August 1, 2009. http://www.documents.dgs.ca.gov/bsc/2009/part11_2008_calgreen_code.pdf

3.1B. Develop a green building ordinance that is consistent with that of neighboring jurisdictions or that is custom to the City of San Carlos that requires a GreenPoint, LEED, or equivalent green building certification per development category.

This measure, selected by the City Council as the preferred green building option, requires the City to adopt a customized green building ordinance similar to other approaches to green building currently moving forward in the Bay Area. This option could be developed as a stand alone green building ordinance specific to the City of San Carlos, or could be completed in coordination with neighboring jurisdictions, the County of San Mateo, or other appropriate entity as preferred by the City Council. This green building option would require a more rigorous set of green building standards than those that may be required by the State. Although there are a number of options for development of a green building code, the requirements would generally be created in cooperation with neighboring cities and counties in order to create regional consistency and therefore ease obstacles to development at the regional level.

Initial Cost

Depending on the type of green building ordinance adopted (regional or custom), the cost of development of the code could vary substantially.

For a regional approach, as preferred by the City Council, the primary costs would be related to development of the green building ordinance since there would be no public workshops or local coordination at the City level. According to City staff, if the ordinance is coordinated with neighboring jurisdictions or coordinated regionally, the cost of the ordinance would be minimal, with only staff time to coordinate the process. Training on LEED and GreenPoint certification would require a day-long training session with approximate costs of \$10,000 for staff time, ordinance and materials.

For a custom approach, the up front cost of developing a green building ordinance just for the City of San Carlos could be higher. According to staff cost estimates and informal queries of neighboring jurisdictions, costs could range from less than \$10,000 to over \$100,000. Most formal cost estimates do not account for staff time associated with project development and are not consistent with our conservative approach to estimating fully loaded cost. For this reason, comparable studies were not available to inform this cost/benefit analysis. Staff estimated the amount of time it would take for City staff to develop a green building code in coordination with consultants and other regional resources.

With San Carlos' history of public involvement, the City could host public workshops to ensure the stakeholders in the community can be involved in what is included in a custom green building code for the City. With the cost of the workshops, writing a custom ordinance, and managing the ordinance development process, the fully loaded costs for the City of San Carlos are estimated to be in the range of \$50,000 to \$75,000. Fully loaded costs include staff time, consultant time, workshop facilitators, and materials for distribution and training for building department employees. If this

option is selected, staff will apply for grant funding to cover the costs but there is no guarantee that these funds would be granted.

For either approach above, an estimated \$100-\$200 in staff time per plan check would also be necessary with the implementation of LEED, GreenPoint, or equivalent building standard, however this cost would be absorbed by the developer through application fees.

Greenhouse Gas Emissions Reductions

LEED, GreenPoint, or equivalent standards are estimated to lower energy consumption in new development and remodels by an estimated 30%. These savings would lower greenhouse gas emissions from the built environment by roughly 11,868 metric tons of CO₂e per year.

Table 7
Summary of Energy Use Reduction Measure 3

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1A	Provide information and support to developers on LEED and GreenPoint standards and enforce State green building standards.	Negligible	535.5 (not included in total)	Negligible
OR				
1B	Develop a green building ordinance either consistent with that of neighboring jurisdictions or custom to the City of San Carlos that requires a GreenPoint, LEED, or equivalent green building certification per development category.	\$10,000	11,868	\$0.84
	Total	\$10,000	11,868	\$0.84

4. Create water and waste efficient landscapes.

**-416
Metric
Tons Co2e**

Expand the current landscaping ordinance to require efficient landscaping in conjunction with residential and commercial property developments and major remodels

The City of San Carlos already has a water-efficient landscaping requirement (Municipal Code Section 15.64) for new residential improvements going before the Residential Design Review Committee. This measure would expand upon the current ordinance to require efficient landscaping practices in new developments and major remodels.

An example of a more encompassing water-efficient landscaping ordinance is that of the City of Menlo Park. Their ordinance requires new development and landscape renovations to submit a landscape plan with sprinkler flow rates, a soils test, irrigation schedule, plant selection, and more.²³

Initial Cost

To update and enforce a more restrictive landscaping ordinance, approximately 40 hours of staff time or \$2,000-\$4,000 would be required. As an information item, additional review by plan-checkers is estimated to be an added half hour per application or \$3,750-\$7,500 assuming 150 qualifying plan checks per year; however these additional costs will be absorbed by the applicants.

Greenhouse Gas Emissions Reductions

This measure saves water and thus the energy used for water filtration and movement. It also lowers the amount of yard waste sent to landfills and reduces demand on our limited supply of fresh water, which largely comes from the potentially-overburdened Hetch Hetchy reservoir system.

The average acre of lawn in the U.S. uses 652,000 gallons of water each year. In northern California, 10,000 gallons of water takes 54 kWh for indoor use and 35 kWh for outdoor use for transport, treatment, distribution, and wastewater treatment.

Using these figures, it can be estimated that a more efficient landscaping requirement would reduce emissions by 416 metric tons of CO₂e per year solely from new development.²⁴ However, since emissions from water consumption within the City were not included in the 2005 Greenhouse Gas Inventory, this reduction cannot be deducted from the baseline as part of our reduction analysis. Therefore, this reduction is an information item only.



²³ City of Menlo Park, "Water-efficient Landscaping Ordinance."

<http://www.menlopark.org/departments/pln/waterlandord.pdf>, accessed Sept. 30, 2008.

²⁴ General Plan Buildout estimates show an increase of 1,686 households before 2030. For the analysis, 50% (843) were assumed to be detached family houses requiring efficient landscaping. Since recent California-specific data is unavailable, the national average yard size (.5 acres) was used as well as national averages for lawn mower gasoline consumption, average water consumption per acre of lawn, and average energy use per gallon of water.

Table 8
Summary of Energy Use Reduction Measure 4

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Expand the current landscaping ordinance to require efficient landscaping in conjunction with residential and commercial property improvements.	\$2,000 - \$4,000	416*	\$4.81 - \$9.62
TOTAL		\$2,000 - \$4,000	416*	\$4.81 - \$9.62

* Information Item Only. Greenhouse gas emissions from water filtration, movement, and treatment were not included in the baseline inventory of emissions referenced in this report as a disaggregated total; therefore these reductions cannot be added to the total reductions from the baseline year.

5. Identify opportunities for on-site renewable energy generation on City and privately-owned property

**-394
Metric
Tons Co2e**

The City does not currently have a formalized program to support on-site energy generation in its facilities or in its municipal code. The City does have solar panels installed on its public work's corporation yard building which generates much of the power used onsite. This reduction measure calls for the City to complete additional research and identify opportunities for incorporating on-site renewable energy generation devices into municipal code language, installing them in additional City-owned facilities, and educating businesses about their benefits. There are multiple State programs that can be used to encourage alternative energy and net-metering. This measure would ensure that City officials and businesses are aware of these programs offering financial assistance and environmental benefits.

****A Note on overall initial cost and emissions reductions for the following supporting measures:** Implementing this measure and its three components (solar, wind, and biomass power) would initiate a \$10,000 one-time cost for a feasibility study of on-site energy generation. The study would focus on incorporating more renewable energy sources into City facilities and services. Until this initial feasibility study and the municipal greenhouse gas audit are completed, it is difficult to make accurate estimations of initial cost and greenhouse gas emissions reductions. For instance, we know that using solar as the power source of sewer pump stations would cost an average \$9 per watt for systems above 2kW, but until the municipal greenhouse gas inventory is complete we do not know how many watts would be replaced.²⁵ However, in order to give some idea of what the energy savings and costs would be to the City for implementing these measures, we are attaching minimum figures to these measures solely for the purpose of weighing the priority of these measures against others in this report.

²⁵ Find Solar. www.findsolar.com. Accessed October 16, 2008.



San Carlos REI Installs Solar Panels

In the fall of 2008, the REI store in San Carlos installed what is believed to be the largest photovoltaic array in San Carlos. This 99 kW system is expected to provide 40% of the store's annual energy needs and save the co-op \$24,000 annually. Avoiding creation of 152,000 pounds of carbon dioxide emissions also fits with the company's environmental commitment. "This investment in solar technology will deliver both financial and environmental benefits, helping to contribute to the long-term strength of the co-op and support our goal to reduce our carbon footprint," said REI's Brian Unmacht.

5.1. Identify opportunities for increasing solar system installations in the community and on City facilities

Under this reduction measure, opportunities for solar panel installation on City facilities would be identified and the permitting process for community installations aided. Maximizing solar panel usage on City facilities is a good way to increase visibility and awareness of solar power. Local governments can borrow money at low interest rates for solar system installation.

Another integral part of this measure is to allow for easy and affordable approval processes for the installation of solar panels within the community. The City could explore options like eliminating the Electrical Permit Fees for Solar Photovoltaic (PV) panels.

For our estimates of initial cost and minimum greenhouse gas emissions savings, it is assumed that the City will install a minimum of an additional 100 kW system on City property and help facilitate at least 300 kW of PV system installations on businesses and houses.

Initial Cost

The average cost of PV installation per kW is \$9,000 without subsidies or financial assistance.²⁶ Keeping with our assumptions above, the gross cost to the City for installing an additional 100 kW of solar panels would be \$900,000 with a 50-year simple payback. Half of this cost is estimated to be paid back by the California Solar Initiative (CSI) with remaining costs being recovered through decreases in energy spending.²⁷

²⁶ Solar Buzz, "Fast solar energy facts," <http://www.solarbuzz.com/FastFactsIndustry.htm>, accessed November 1, 2008. Middle of \$8-10 per watt price range

²⁷ California Solar Initiative pays \$0.50 per kWh for solar power generation in the first five years. With an average of 4.5 hours of sunlight each day over the course of a year (Rocky Grove Sun Company, "How many PV modules?" <http://www.rockygrove.com/design/howmany.html>, accessed November 3, 2008) we can estimate that a 100 kW

The remaining \$450,000 can be paid incrementally through loans, but for the purpose of this analysis we are assuming the initial cost will be paid up front.

Greenhouse Gas Emissions Reductions

Solar power uses sunlight to create energy, thus eliminating the need for fossil fuels which produce greenhouse gas emissions. As described earlier, San Carlos has already installed a 60 kW PV system atop of the corporation yard and helped facilitate the installation of 83 kW of residential solar system installation.

The addition of 400 kW of solar energy in place of traditional energy would reduce emissions in San Carlos by 263 metric tons of CO₂e per year. This estimate is based on the average hours of sunlight throughout the year (4.5 hours).

5.2. Identify opportunities for Wind energy generation

Under this reduction measure, the City would identify opportunities for increasing wind energy generation in appropriate locations for both the community and City facilities. Wind energy can be very cost-effective in windy areas. Even a small wind turbine can produce enough energy to power a home, small business, or school. For instance, the City of Berkeley installed a 35 foot high turbine at a nature center and it produces 60-80% of the building's electricity use.

As part of the initial feasibility study for on-site energy production, it is recommended that the City identify barriers to the installation of small wind turbines such as permitting complications, zoning barriers, and utility grid hookups.

Initial Cost

Small wind energy systems cost from \$3,000 - \$5,000 for every kilowatt of generating capacity, or about \$40,000 for a 10 kW installed system without taking into account rebates or incentives.²⁸ For the purpose of analyzing the cost benefit of this measure, we will assume that the City installs ten small-scale wind turbines, which would equal \$30,000 - \$50,000 without assistance.

The California Solar Initiative provides rebates for wind turbines less than 50 kW. The American Wind Energy Association estimates that this program, along with other federal programs, will cover the cost of a wind turbine within 10 years, resulting in 20 years of relatively no-cost energy.²⁹

For the purposes of this study, we will assume that half of the cost of the wind turbines will be borne up-front in order to create consistency with other measures that also have a payback. Therefore, the initial cost of ten wind turbines is



system would produce 164,250 kWh per year (100 kW of PV installed * 4.5 sun hours per day * 365 days = 164,250 kWh). This equates to \$410,625 over five years, or roughly half of the cost of installation.

²⁸ American Wind Energy Association (AWEA), "Finding Incentives,"

<http://www.awea.org/smallwind/toolbox2/financing.html>, accessed November 3, 2008.

²⁹ AWEA, "Finding Incentives"

estimated to be \$15,000 - \$30,000 assuming most planning and coordination by Staff is completed as part of the initial feasibility study.

Greenhouse Gas Emissions Reductions

For the purpose of this cost/benefit analysis, we assumed the City will install at least ten small-scale wind turbines and the community will install at least five. Each turbine of 10 kW will produce approximately 22,000 kWh per year.³⁰ That's a total of 328,500 kWh of clean energy produced per year in San Carlos and 131 metric tons of CO₂e prevented from release into the atmosphere.

5.3. Identify opportunities for Biomass energy opportunities

This measure would lead to the identification of opportunities for biomass energy production and consumption. Biomass energy is energy from plants and plant-derived materials like agricultural waste, yard waste, and even methane from waste decomposition. It can be used for power production, products, and fuels.³¹

It is difficult to make an estimate of initial cost and greenhouse gas emissions reductions from biomass energy, even for the sake of analysis. The only method of biomass energy production that is quantifiable is methane capture. However, since the landfills serving the City of San Carlos are all outside of City limits, it is unlikely that this biomass energy could be routed back into City limits.

Table 9
Summary of Energy Use Reduction Measure 5

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
Overall Cost for a feasibility study of on-site renewable energy generation		\$10,000	0	N/A
1	Identify opportunities for increasing solar system installations in the community and on City facilities.	\$480,000*	263*	\$1,825
2	Wind energy generation	\$15,000 - \$30,000*	131*	\$114.50 - \$229
3	Biomass energy	Unknown	Unknown	N/A
TOTAL		\$505,000 – \$520,000	394	\$1,282 - \$1,320

* These are minimum estimates of what the City could produce under these measures for the purpose of the cost/benefit analysis. These cost estimates do not factor in the energy use reductions that would result, and the associated utility bill savings. Estimated return on investment is 15-20 years.

³⁰ 10 kWh system * .25 capacity factor * 24 hours/day * 365 days per year = 21,900 kWh. Capacity factor provided by AWEA at <http://www.awea.org/faq/basicen.html> accessed November 4, 2008.

³¹ National Renewable Energy Laboratory, Biomass Energy Basics. http://www.nrel.gov/learning/re_biomass.html. Accessed October 13, 2008.

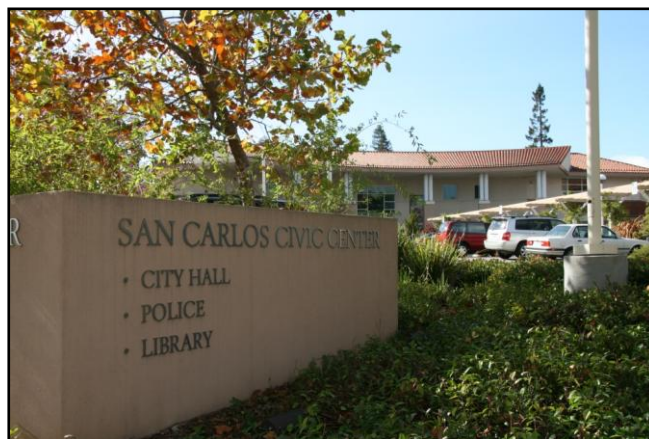
6. Implement reduction strategies included in the energy audit of City facilities and continue to monitor City facility performance

**-16
Metric
Tons Co2e**

The City is currently working on auditing the energy performance of City owned and operated facilities. This measure is to implement the recommendations included in the audit to increase efficiency in City-owned and -operated buildings. The City may also consider seeking energy audits of organizations to which it makes financial contributions.

A lighting audit of the Adult Community Center (ACC) has already been completed. The preliminary audit shows that the City will save approximately \$91,000 in the long run from a lighting retrofit in the ACC alone!

Lighting retrofits and other measures will continue to save the City money on electricity while lowering its greenhouse gas emissions. It will also establish the City as an example for privately-owned facilities to follow.



Initial Cost

Until the audit is completed, the cost of modifying City facilities and their operations to increase efficiency is unknown.

Greenhouse Gas Emissions Reductions

The total greenhouse gas emissions reductions cannot be calculated until the audit of City facilities is completed. However, from the completed audit of the Adult Community Center we can calculate that at least 16 metric tons of CO_{2e} will be saved annually.

Table 10
Summary of Energy Use Reduction Measure 6

	Component	Initial Cost to the City	GHG Reduction (metric tons CO _{2e} / year)	Cost per metric ton CO _{2e}
1	Implement the audit of municipal facilities when completed	Unknown	16	N/A
TOTAL		Unknown	16	N/A

7. Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect

-2,230
Metric
Tons Co2e

'Cool roofs' and 'cool pavements' are made of materials with higher solar reflectivity, which counters the urban heat island affect and reduces air conditioning use. Dark pavement and roofs absorb heat from the sun, creating higher urban temperatures and increasing the need for air conditioning. According to a recent study by Akbari, Menon, and Rosenfeld, using white materials for a 1,000 square foot roof can reduce carbon dioxide emissions by approximately 10 metric tons and urban surface temperatures up to three degrees.

California has required white colored material for flat roofs since 2005. Under this reduction measure, the City would pave surfaces with high-albedo concrete or aggregate when in need of repair with the overall goal of paving 15% of hardscape under the City's control with high albedo materials. Surfaces can include parking lots, sidewalks, driveways, and roads.

Initial Cost

The US Environmental Protection Agency identifies multiple cool pavement technologies, many of which are similar if not lower in cost to traditional asphalt. There would be some staff time for coordinating with public works and including the high albedo content requirements in the design of projects included in the Capital Improvement Plan (CIP). CalTrans would also need to be contacted regarding El Camino Real and the State's efforts to increase albedo on State highways.

Greenhouse Gas Emissions Reduction

The Lawrence Berkeley National Laboratory Urban Heat Island Group estimates that pavement reflectivity can be raised on average only 15% in an urban area. This 15% causes four metric tons of carbon dioxide to be offset per 1,000 square feet replaced when compared to traditional asphalt. Assuming that 12% of San Carlos is covered in pavement, or approximately 2 million square feet, and assuming that 30% of hardscape controlled by the City is repaved with high albedo content material by 2030, we estimate that this measure will result in at least 2,320 metric tons of CO₂ equivalent savings per year.

Table 11
Summary of Energy Use Reduction Measure 7

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.	Negligible	2,320	Negligible
TOTAL		Negligible	2,320	Negligible

8. Encourage tree planting

**-356
Metric
Tons Co2e**

This reduction measure calls for increased support for community tree planting programs and more rigorous tree planting requirements for new development. Trees reduce greenhouse gas emissions by naturally sequestering carbon dioxide and creating more oxygen. Additionally, the shade from trees helps minimize or prevent the urban heat island effect, a condition where urban surface and air temperatures are higher than rural surrounding areas due to development patterns.³² The urban heat island effect can have a large impact on local air temperatures and long-term climate patterns. Air temperature differences of approximately 3.6°F to 7.2°F have been observed for urban neighborhoods of contrasting tree cover, averaging approximately 1.8°F per 10% canopy cover.³³

8.1. Provide for City assistance to community tree planting programs and efforts

Many individuals and community groups would be able to coordinate tree planning programs with help from the City. Namely, community efforts need help coordinating with utility providers over the safe and adequate placement of trees to ensure that they do not conflict with underground utility pipes and overhead wiring. The City could also provide design examples and standards to the public for the selection and placement of trees. By reaching out to community groups and



³² US Environmental Protection Agency, "Heat Island Effect." <http://www.epa.gov/hiri/about/index.html>. Accessed Oct 12, 2008.

³³ Scott, Simpson, and McPherson. "Effects of Tree Cover on Parking Lot Microclimate and Vehicle Emissions." *Journal of Arboriculture* 24(3): May 1999, 129.

offering support, it will become easier to plant trees on private property and parking lots.

Initial Cost

The cost of this measure would be twenty hours of staff time required for kickoff of the program and the preparation of a Council resolution (\$1,000-\$2,000 depending on staff wage). There would be an additional staff time cost of one hour per tree for coordination. Assuming that 200 trees are planted by community tree planting programs, this could be up to \$20,000 in staff cost, however this does not take into consideration community participation. Depending on the level of staff involvement, this measure could cost anywhere from \$1,000 with community group and resident participation to \$22,000 with entirely municipal coordination.

Greenhouse Gas Emissions Reductions

It is estimated from previous tree-planting programs that the community would plant approximately 400 new trees as a result of a City assistance program. This measure would be implemented in two phases: 1) 200 trees planted before 2020 and 2) 200 trees planted before 2030. Based on known carbon sequestration rates and studied decreases in cooling costs as a result of increased tree canopy, it is estimated that planting 400 trees within the City of San Carlos will save 102 metric tons of CO₂e per year.

8.2. Require a specific tree coverage and tree replacement requirement for new development

San Carlos currently requires 10% landscaping for new development, but this landscaping can be placed anywhere on the property. Providing for even shading throughout parking lots and properties will shade houses and pavement, thus reducing the cooling costs, energy use, and the urban heat island effect. This requirement would also allow for solar panels to be installed in lieu of trees being planted when these panels provide shade on parking lots.

Initial Cost

This reduction measure can be implemented as part of the next Zoning Code update. Staff estimates that updating the zoning code with shading requirements (including the shading requirement in the next measure) will take 36 hours of Staff time, which is equivalent to \$1,800 - \$3,600.

Greenhouse Gas Emissions Reductions

Based on San Carlos' projected commercial and residential growth rates, we estimate that this reduction measure will result in 900 additional trees within the City by 2030. It is estimated that planting these 900 trees will save 228 metric tons of CO₂e per year due to known carbon sequestration rates and studied decreases in cooling costs as a result of



increased tree canopy.

8.3. Develop and implement a shading requirement for City-owned parking lots

While the City is unable to require existing parking lots and developments to adhere to a shading requirement, it is able to renovate its own parking lots and streets to include more trees. This reduction measure should allow for solar panels to be installed in lieu of trees when they provide equivalent shading.

Initial Cost

This reduction measure is more cost intensive than the previous two. According to the Department of Public Works, the cost per tree would be \$1200 per year for watering for the first five years and eight hours a year of maintenance (trimming, debris cleanup, etc.). Averaging these yearly costs, a tree costs approximately \$10,000 over its lifespan. Assuming 50 trees are planted as a result of this measure, an estimated cost of \$500,000 would be borne over time. However, since maintenance and upkeep costs are not included in the initial cost analysis, this figure is for information only.

Installing trees in existing parking lots is also expensive because half of a parking spot is lost for every tree. This loss of parking invalidates the \$15,000 spent for construction of the parking spot; however this figure will not be included in our total as it is a sunk cost.

Actual costs for developing a shading requirement for City parking lots is combined with the previous measure for a total of 36 hours staff time.

Greenhouse Gas Emissions Reductions

It is estimated that a shading requirement for City-owned parking lots would result in 100 new trees within the City of San Carlos. Based on known carbon sequestration rates and studied decreases in cooling costs as a result of increased tree canopy, it is estimated that these 50 trees will save 26 metric tons of CO₂e per year.

Table 12
Summary of Energy Use Reduction Measure 8

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Support community tree planting programs	\$1,000 - \$22,000	102	\$9.80 - \$215.69
2	Create a shading requirement for new development	\$1,800-\$3,600	228	\$7.09 - \$14.17
3	Develop a shading requirement for City parking lots		26	
TOTAL		\$12,800-\$25,600	356	\$35.96 - \$71.91

Energy Use Reduction Measures – Progress to Date

We are well on our way to achieving the emissions reductions outlined in this chapter. Between our baseline year of 2005 and the development of this Plan in 2009, the City and community have embarked on multiple projects and programs to reduce emissions in the energy sector. These efforts are summarized below and measured in comparison to the overall 2030 energy emission reduction target.

San Carlos Green Business Program

At the invitation of San Mateo County Supervisor Mark Church and the County's Recycle Works.Org Division, San Carlos became one of 6 cities in San Mateo County to pilot this County's participation in the Bay Area Green Business Program last summer. The program, which started 10 years ago in Alameda County is sponsored by the Association of Bay Area Governments (ABAG) and encourages local businesses of all sizes to adopt Green Business Practices and then to participate in a certification process. Certification involves completing an 11 page checklist, working with your City, local utilities and regulators and the County. Certified Green Businesses receive a Green Business Program window sticker for their firm, Green Business artwork for their web site and a listing in a Bay Area Green Business Guide that now tops 1,000 firms.

To date, 20 San Carlos businesses have earned the Bay Area Certified Green Business designation. Several more are in the process of gaining their Certified Green Business award.

We estimate that this effort to date has reduced **133 metric tons of CO₂e**, which contributes directly to Reduction Measure 1 – Expand Energy Saving Opportunities to businesses.

“Greenest City Challenge”

San Carlos won third place nation-wide in the Yahoo! “Greenest City Challenge” in 2007 and received 5,000 compact fluorescent light bulbs (CFLs), which were distributed to residents. Additionally, between 2007 and 2008, San Carlos Green distributed 450 additional CFLs donated by PG&E, along with 200 garden hose nozzles, 100 low-flow shower heads, 200 low-flow sink aerators, and several hundred toilet leak detection tablets donated by California Water Service Company. All devices were accompanied by literature on energy and water conservation.

The LED lightbulbs are estimated to have saved **26 metric tons of CO₂e**, which contributes directly to Reduction Measure 2 –Improve Residential Energy Efficiency

The San Carlos Community Solar Program

In 2007, residents were invited to participate in the Community Solar Discount Program in partnership with Solar City and San Carlos Green. The 18 participating residents

exceeded the Program's goals, installing 83kW of solar power generation in just three months.

The Community Solar Program is estimated to save approximately **54 metric tons of CO₂e per year**, which contributes directly to Reduction Measure 5 - Identify opportunities for on-site renewable energy generation on City and privately-owned property.

Analysis of Reduction Target – Energy Use

The emissions reductions estimates from energy use are summarized below. As the chart concludes, the eight energy use measures analyzed in this chapter are estimated to reduce energy emissions by approximately 18%.

Table 13
Summary of Emissions Reductions from Energy Use Reduction Measures

		2030 Metric Tons CO ₂ e per year
Reference year 2030 Energy Use "Business-as-Usual" Emissions		156,135
1	Expand energy saving opportunities to businesses	- 13,300
	1.1. Consider developing a tax rebate program for efficiency improvements in businesses.	
	1.2. Expand energy saving opportunities and assistance for large and small commercial and industrial businesses.	
2	Improve residential energy efficiency	- 14,115
	2.1. Establish energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards.	
	2.2. Perform energy-efficient lighting retrofits and/or home energy audits.	
	2.3. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	
	2.4. Expand and better integrate programs that increase energy efficiency in low-income households.	
3	Adopt a green building standard for new development and major remodels.	- 11,868
	3.1a. Enforce State green building requirements and provide information and support to developers on LEED and GreenPoint standards. Option 3.1b, if chosen, would replace option 3.1a.	
4	Create water and waste efficient landscapes.	*- 416
	4.1. Formalize the City's efficient landscaping practice by writing it into the Parks Master Plan.	
	4.2. Expand the current landscaping ordinance to require efficient landscaping in conjunction with residential and commercial property improvements.	

		2030 Metric Tons CO ₂ e per year
Reference year 2030 Energy Use "Business-as-Usual" Emissions		156,135
5	Identify opportunities for on-site renewable energy generation on City and privately-owned property.	- 394
	5.1. Identify opportunities for increasing solar system installations in the community and on City facilities.	
	5.2. Identify opportunities for Wind energy generation.	
	5.3. Identify opportunities for Biomass energy opportunities.	
6	Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	- 16
	6.1. Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	
7	Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.	- 2,320
	7.1. Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.	
8	Encourage tree planting	- 356
	Support community tree planting programs	
	Create a shading requirement for new development	
	Develop a shading requirement for City parking lots	
Total Community Energy Use Emissions Reduction		- 42,369
California Renewable Portfolio Standard (RPS)		- 31,566
Net 2030 Community Energy Use Emissions		**81,665
Base Year 2005 Energy Use Emissions		103,797
Percent below 2005 level		9.89%

* Information Item Only. Greenhouse gas emissions from water filtration, movement, and treatment were not included in the baseline inventory of emissions referenced in this report as a disaggregated total.

**Does not include emissions reductions from water (Measure 4)

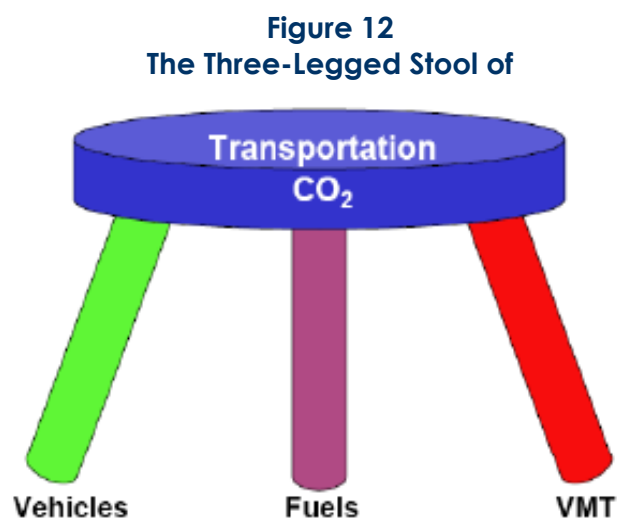
V. Transportation and Land Use Strategies

The transportation sector is the largest contributor to greenhouse gas emissions in San Carlos (56.4%). These emissions are from vehicles traveling on the length of State Highway 101 running through San Carlos, on-road vehicle miles traveled, and an estimate of Caltrain diesel consumed by San Carlos weekday commuters. If traffic patterns within San Carlos continue as business-as-usual, it is estimated that emissions from the transportation sector will increase by over 14.5% due to population growth and historic growth rates.

**Table 14: Transportation “Business-as-Usual”
Projected Emissions Growth (CO₂e per year)**

Sector	2005	2020	2030	Percent Change from 2005 to 2030
Transportation (highway and community)	150,663	175,891	195,016	29.4%

Achieving our reduction target will require significant changes to our transportation system. These changes depend on three sectors – vehicles, fuels, and vehicle miles traveled – that are also referred to as the “three legged stool” of transportation.



Source: 5th Annual CA Climate Change Conference presentation by Daniel Sperling, UC Berkeley and CARB

The measures below cover all three legs of the stool by addressing improvements in vehicle efficiency and public transportation, promotion of alternative fuels, and methods of decreasing the amount of vehicle miles traveled by residents of San Carlos.

This section, while mainly focused on transportation, includes another key element highly integrated and almost inseparable from transportation: Land Use. At the basic level, it is land use and thus the distance between and orientation of destinations that requires us to travel. Only by changing our land use patterns and environment in which we live will we

significantly change our travel patterns.

Reducing greenhouse gas emissions from transportation will not only give San Carlos environmental benefits, but also an improved quality of life. Communities that are less dependent on personal vehicles exhibit a higher level of safety in streets, better health from increased exercise, improved accessibility, and more financial savings from decreased car maintenance.

The reduction measures of this section to decrease vehicular emissions are:

1. Encourage development that is mixed-use, infill, and higher density.
2. Increase housing density near transit.
3. Increase bike parking.
4. Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, and walking.
5. Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.
6. Provide for a shuttle service connecting areas not adequately served by public transit to public transit.
7. Promote car sharing programs.
8. Enforce affordable housing development standards
9. Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.
10. Increase accommodation and promotion of alternatively fueled vehicles and hybrids.



Given the high level of emissions from the transportation sector, these measures should be acted on quickly and efficiently. Not changing our behavior could result in the projected 'business as usual' 2030 scenario.

1. Encourage development that is mixed-use, infill, and higher density

**-5,544
Metric
Tons CO₂e**

The principles of infill, higher density, and mixed-use, also known as 'smart growth,' lead to decreased vehicle miles traveled and increased neighborhood vitality. These methods of development also have multiple social benefits, including: better health, lower infrastructure costs, and increased accessibility. Infill, higher density development is especially important to create more urban housing within San Carlos and thus the Bay Area. Increasing our housing stock will prevent more suburban sprawl from being developed on the outskirts of our region. Sprawl is a huge barrier to climate action because it creates a strain on infrastructure and is highly automobile-dependant. By changing our land use patterns, we can allow more people to live in areas where they can walk to complete their errands rather than drive.

1.1. Revise municipal codes to encourage and allow for mixed-use, infill, and higher-density development

Under this measure, areas of San Carlos would be identified as viable for higher densities and mixed use. These could be areas that have little neighborhood-serving retail like laundromats, corner markets, and coffee shops or they could be areas in need of revitalization. The City might also consider the balance of jobs to housing by increasing densities near commercial centers.



It is important to differentiate the goals of this reduction measure from Transit Oriented Development, or TOD, which is discussed in the next measure of this chapter. While the principles of TOD and smart growth overlap considerably, smart growth can be applied City-wide while TOD is more appropriate on a smaller-scale for areas in need of connectivity. A TOD is typically defined as a residential and commercial center designed around a rail or bus station in order to encourage transit ridership.³⁴

Although municipal code densities may be constricted by the preferred land use alternative included in the 2009 General Plan update currently underway, this reduction measure will encourage planners to approve or give incentives for building at the maximum allowed density for the area.

Initial Cost

City Staff estimates that writing mixed-use, infill, and higher-density code revisions will consume approximately 90 hours of staff time which equals \$4,500-\$9,000 a year depending on pay rate. It is important to note that these hours can be spent in conjunction with other code revision efforts following the General Plan update.

Greenhouse Gas Emissions Reductions

Mixed-use, infill, and higher density development is known to have many environmental benefits. A 2005 Seattle study found that residents of neighborhoods where land uses were mixed and streets were better connected, making non-auto travel easier and more convenient, traveled 26% fewer vehicle miles than residents of neighborhoods that were more dispersed and less connected.³⁵

Assuming that this reduction measure results in 50% of new development being mixed-use, infill, and higher density, we can estimate that half of the new population will be driving 25% less in 2020. Assuming that growth in the transportation sector is due to new residential development and job growth, we can estimate that greenhouse gas emissions will reduce by at least 5,544 metric tons of CO₂e per year by 2030.

³⁴ Victoria Transportation Planning Institute, *Transit Oriented Development*, www.vtpi.org/tod/tod45.htm, accessed October 30, 2008.

³⁵ US Environmental Protection Agency (EPA). "Environmental Benefits of Smart Growth." <http://www.epa.gov/dced/topics/eb.htm>, accessed Oct. 1, 2008.

Table 15
Summary of Transportation and Land Use Reduction Measure1

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Revise municipal codes to encourage and allow for mixed-use, infill, and higher-density development.	\$4,500-\$9,000	5,544	\$0.81 - \$1.62
TOTAL		\$4,500-\$9,000	5,544	\$0.81-\$1.62

2. Increase housing density near transit

**-4,957
Metric
Tons CO₂e**

Housing density near transit, known as Transit Oriented Development or TOD, can make a city more equitable, accessible and lower greenhouse gas emissions from personal vehicles. The current General Plan update process encourages greater housing density near transit as well.

The benefits of TOD have been researched and proven. A study of the Portland area found that 30% or more of the Transit Oriented Development residents commuted by the regional light rail system at least once a week and 23-33% used transit as their primary commute mode.³⁶

Overall, commuting by transit has increased when people moved to Transit Oriented Developments. A 2003 California TOD travel characteristics study found TOD office workers within a half mile of rail transit stations have transit commute shares averaging 19% as compared to 5% region wide. For residents, the statewide average transit share for TODs within a half mile of the station was 27% compared to 7% for residences between a half mile and three miles of the station.³⁷



2.1. Revise municipal codes to encourage and allow for higher-density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of personal automobiles

Many residents and businesses are attracted to higher-density, accessible development, however it is often difficult to change land use regulations to allow for

³⁶ Victoria Transportation Planning Institute, *Transit Oriented Development*, www.vtpi.org/tdm/tdm45.htm, accessed October 30, 2008.

³⁷ Victoria Transport Policy Institute. "Transit Oriented Development." Online TDM Encyclopedia, <http://www.vtpi.org/tdm/>, accessed Sept. 30, 2008.

and encourage higher-density developments around transit stations. Parking requirements, density and height limitations, and single-use zoning in many locations make TOD difficult to get approved.

Initial Cost

City staff has indicated an estimate of roughly \$22,500-\$45,000 in initial staff time for a planner to write TOD code revisions (equivalent to 450 hours).

Greenhouse Gas Emissions Reductions

It is estimated that transit oriented development will reduce San Carlos' greenhouse gas emissions by 4,957 metric tons of CO₂e per year. This estimate assumes that half of the total housing development in San Carlos between the years 2010 and 2030 will be TOD.

Table 16
Summary of Transportation and Land Use Reduction Measure 2

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Revise municipal codes to encourage and allow for higher-density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of personal automobiles.	\$22,500-\$45,000	4,957	\$4.54 - \$9.08
TOTAL		\$22,500-\$45,000	4,957	\$4.54-\$9.08

3. Increase bike parking

**-150
Metric
Tons CO₂e**

Dedicated bike parking (in lieu of locking to trees and utility poles) reduces bike theft and increases convenience for cyclists. As costs of personal vehicle travel rise, it is likely that more residents of San Carlos will come to rely on bicycles as a fast and inexpensive mode of travel. Bicycles are the most efficient mode of transportation and are especially appropriate in reducing the number of short vehicle trips (up to five miles), which constitute more than half of all driving. As a part of this measure, we should encourage, support, and prepare for this modal switch as much as possible.

3.1. Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience

San Carlos currently requires new developments with fifty or more parking spaces to provide bicycle parking spaces equal to a minimum of 10% of the required vehicles spaces. This portion of the municipal code could be expanded. For example, the City of Portland requires one bike parking space per 3,000 square feet of commercial or office space or 5-10% of the number of automobile spaces. The City of Santa Cruz requires two bike parking spaces plus 15% of the number of automobile spaces, 20-60% of which are required to be Class 1 individual lockers.³⁸



Initial Cost

City Staff estimates approximately 18 hours of effort for planning staff to write bike parking code revisions in conjunction with supporting measure 3.2 (below). When assuming an hourly rate of \$50-\$100 per hour, this translates to \$900-\$1,800 in initial staff time.

Greenhouse Gas Reduction

Assuming that increased bike parking would replace 300 average-length weekly car trips, it is estimated that greenhouse gas emissions will be reduced by 75 metric tons of CO₂e per year.

3.2. Require large employers to provide facilities that encourage bicycle commuting including shower facilities and covered or indoor bicycle parking

A large barrier to cycling as a means of traveling to and from work is lack of facilities for changing into work clothes and protecting a bicycle from the rain. Shower facilities allow workers to rinse off before going to work, which encourages people who live further away to be able to cycle to work. Covered or indoor bicycle parking not only increases security, but prevents bikes from getting wet during the winter. An example of such requirement is the City of Vancouver, which requires any development with four or more required bike parking spaces (based on the number of automobile spaces) to provide shower and wash bin facilities.³⁹

Initial Cost

City Staff estimates approximately 18 hours of effort for planning staff to write bike parking code revisions in conjunction with supporting measure 3.1 (above). When

³⁸ Victoria Transport Policy Institute. "Bicycle Parking." Online TDM Encyclopedia, <http://www.vtpi.org/tdm>, accessed Sept. 30, 2008.

³⁹ Victoria Transport Policy Institute. "Bicycle Parking." Online TDM Encyclopedia, <http://www.vtpi.org/tdm>, accessed Sept. 30, 2008.

assuming an hourly rate of \$50-\$100 per hour, this translates to \$900-\$1,800 in initial staff time.

Greenhouse Gas Reduction

Assuming that increased facilities would replace 200 average-length weekly car trips, it is estimated that greenhouse gas emissions will be reduced by 50 metric tons of CO₂e per year.

Table 17
Summary of Transportation and Land Use Reduction Measure 3

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience.	\$900 - \$1,800	75	
2	Require large employers to provide facilities that encourage bicycle commuting, including shower facilities, and covered or indoor bicycle parking.		50	
TOTAL		\$900 - \$1,800	125	\$7.20 - \$14.40

4. Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools

**-170
Metric
Tons CO₂e**

There are many design and policy methods to promote pedestrian and bicycle travel, including: increased tree planting, median landscaping, clearly dedicated crosswalks (painted or paved differently), and count-down style cross signals. All of these methods promote enhanced aesthetics, reduced vehicle speeds, and safer pedestrian and bicycle environments.

The City of San Carlos has adopted the *Streets and Sidewalks, People and Cars: The Citizens' Guide to Traffic Calming* by Dan Burden as the City's blueprint for traffic calming. It requires that traffic calming be paid for by the neighborhood requesting them; however this option for the community is not widely publicized.

The supporting measures below will ensure that San Carlos is friendly to pedestrians and bikers as demand increases in the future. Not only will this promote emission reductions, but it will lead to a healthier and more active lifestyle for residents.

4.1. Promote traffic calming methods on City streets such as landscaped median barriers and traffic circles

Traffic calming measures that cause cars to drive at decreased speeds not only increase pedestrian and cyclist safety, but they decrease greenhouse gas emissions by preventing stop-and-go traffic. Studies show that median barriers cause an average 31% decrease in traffic volume, or a decrease of 1,167 vehicles per day (from a sample of 10 sites; average includes various types of volume control measures).⁴⁰



Initial Cost

As previously described, traffic calming measures are the responsibility of the neighborhoods, however this information could be provided in utility bills for greater outreach and public awareness of the opportunity at a negligible cost.

Greenhouse Gas Emissions Reductions

To quantify the greenhouse gas emissions reduction from this measure, it was combined with components 4.2, 4.3 and 4.4 under this measure in order to create a scenario parallel to similar quantified case studies and research. It is therefore estimated that these four reduction measures will cause a total of 750 additional weekly biking and walking trips originating from within the City of San Carlos. Assuming these trips are replacing vehicle trips, these reduction measures will reduce greenhouse gas emissions by at least 170 metric tons of CO₂e.

4.2. Establish clear and convenient pedestrian rights of way with shade and minimal tripping hazards.

The City currently uses \$50,000 a year responding to complaints about public rights of way and pedestrian safety, however creating convenient pedestrian rights of way could be more actively enforced.

Initial Cost

The City already allocates \$50,000 a year to responding to complaints about pedestrian safety. City staff does not estimate that any additional funds will be necessary to implement this reduction measure.

Greenhouse Gas Emissions Reductions

As stated above in measure 4.1, this reduction measure will reduce greenhouse gas emissions by 124 metric tons of CO₂e per year in conjunction with measures 4.1, 4.3, and 4.4.

⁴⁰ Fehr and Peers, TrafficCalming.org, <http://www.trafficcalming.org>, accessed Sept. 30, 2008.

4.3. Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently being updated

Communities that improve cycling conditions often experience significant increases in bicycle travel and related reductions in vehicle travel. For U.S. cities with a population of more than 250,000, each additional mile of bike lanes per square mile is associated with a roughly one percentage point increase in bicycle commute mode share.⁴¹ All new intersection sensors within the City of San Carlos are bike friendly; however marking where bikes should be situated in order to optimize sensor activation would be beneficial.

Initial Cost



Preparation of the Bicycle Transportation Plan has already been accounted for in the current budget. The installation of striping for bike intersections would cost approximately \$100 per striped lane, or for a typical intersection with 4 lanes, \$400.

Assuming three additional miles of bike lanes are installed and ten bike intersections are striped, we can estimate that this measure will cost approximately \$157,000.

Greenhouse Gas Emissions Reductions

As stated above in measure 4.1, this reduction measure will reduce greenhouse gas emissions by 124 metric tons of CO₂e per year in conjunction with measures 4.1, 4.2, and 4.4.

4.4. Promote “Walk pools” or “Walking buses” to increase the number of students who walk to school

This measure would expand upon an effort currently in place at some San Carlos schools to establish “walking buses” or “walk pools” to school. Parents would volunteer to meet students at select locations and chaperone them to school on a pre-established route.

Under this reduction measure, the City would coordinate with Safe Routes to School or similar parent groups and school administration to ensure that routes are clear of obstacles and safe for walking.



⁴¹ Fehr and Peers, TrafficCalming.org, <http://www.trafficcalming.org>, accessed Sept. 30, 2008.

Initial Cost

The cost of advertising and coordinating the routes for the program would be borne by parent groups and schools. The cost to the City for coordinating with these programs would be minimal and largely absorbed by the other measures under this measure and existing programs.

Greenhouse Gas Emissions Reductions

As stated above in measure 4.1, this reduction measure will reduce greenhouse gas emissions by 124 metric tons of CO₂e per year in conjunction with measures 4.1, 4.2, and 4.3.

Table 18
Summary of Transportation and Land Use Reduction Measure 4

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Promote traffic calming methods on city streets such as landscaped median barriers and traffic circles	Cost borne by neighborhood	170	N/A
2	Establish clear and convenient pedestrian rights of way with shade and minimal tripping hazards.	Negligible		
3	Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently under review.	\$157,000		
4	Promote "Walk pools" or "Walking buses" to increase the number of students who walk to school.	Negligible		
TOTAL		\$157,000	170	\$923.52

5. Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking

**-122
Metric
Tons Co₂e**

As costs of personal vehicle travel rise, residents of San Carlos will want to use alternative modes of transportation. The City should be prepared for this increase of walkers, bikers, and transit riders.

This measure also promotes equity in the City, providing low-income residents with convenient modes of travel that are more affordable than personal automobile use.

5.1. Create a plan to identify and address barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see to the plan's implementation

This reduction measure is largely completed through the Bicycle Transportation Plan, which is currently under revision. This plan identifies multiple barriers and opportunities to pedestrian and cyclist activity to and from points of interest like gyms, employment centers, and schools.

Initial Cost

The initial cost of this measure would be negligible since the plan is already in the process of being updated. Many of the expected recommendations of the Bicycle Transportation Plan are largely encompassed in the initial cost estimations of other reduction measures in this Plan, yet specific total cost cannot be calculated until the Bicycle Transportation Plan is completed.

Greenhouse Gas Emissions Reductions

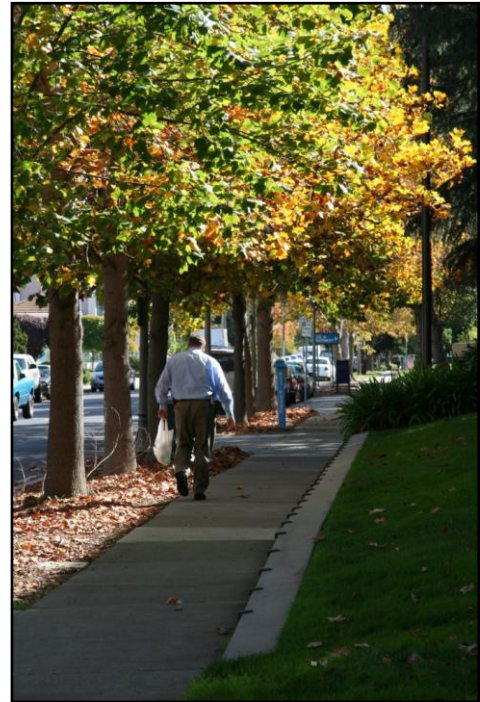
The emissions reductions cannot be calculated until the Bicycle Transportation Plan is completed.

5.2. Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location. Require parking lots to be designed in a way that promotes pedestrian, transit, and bicycle travel to and from the site.

As part of project approval, new large-scale developments would be required to analyze transit, biking, and walking accessibility to and from their location.

This measure would also mandate parking lot design that includes clearly marked and shaded pedestrian pathways between transit facilities and building entrances.

Pathways must connect to transit facilities internal or adjacent to project site. The site



plan would demonstrate how the pathways are clearly marked, shaded, and placed between transit facilities and building entrances.

Initial Cost

The only cost associated with this measure is plan review to ensure that new large-scale development applications address transit, biking, and walking access. It is estimated that this requirement will cost an additional four hours per plan check, or \$200-\$400 dollars, however this cost would be absorbed by the applicant.

Greenhouse Gas Emissions Reductions

We estimate that these measures will create 400 additional walking and biking trips per week that were originally taken by car. This reduction in vehicle miles traveled would result in 122 metric tons of CO₂e per year.

5.3. Provide for an education program to residents and businesses as well as increased code enforcement in order to minimize vegetation that degrades access along public rights of way

Trees and shrubs often clutter sidewalks, creating an accessibility and convenience issue that acts as a deterrent to pedestrian travel. The City has an ordinance to minimize vegetation that degrades access along public rights of way, but this ordinance is not enforced. This measure would require increased city staff time for code enforcement to address the issue.

The City has an ordinance to minimize vegetation that degrades public rights of way, but this ordinance is not enforced to its fullest extent. This measure would educate residents on their responsibility to maintain public rights of way adjacent to their properties. It would also provide for increased enforcement and, possibly, an outlet for residents to report violations.

As part of the implementation of this measure, the City could consider a Rights Of Way (ROW) management program to address street tree maintenance and planting along public rights-of-way like sidewalks and paths.

Initial Cost

This reduction measure would cost an approximate \$9,000-\$18,000 for Right of Way (ROW) management in the initial year of implementation. In addition, an expected 300 hours of added enforcement would take place annually at \$15,000-\$30,000 in staff costs.

Greenhouse Gas Reduction

It is unclear how unobstructed pedestrian paths would affect travel behavior and, thus, greenhouse gas emissions. However, this reduction measure largely contributes to reduction measure 6 in this section, which is quantified to save 122 metric tons of CO₂e per year.

Table 19
Summary of Transportation and Land Use Reduction Measure 5

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Create a plan to identify and address barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see to the plan's implementation.	Negligible	Unknown	N/A
2	Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location. Require parking lots to be designed in a way that promotes pedestrian, transit, and bicycle travel to and from the site.	Negligible	122	Negligible
3	Provide for an education program to residents and businesses as well as increased code enforcement in order to minimize vegetation that degrades access along public rights of way.	\$24,000 - \$48,000	Unknown	N/A
TOTAL		\$24,000 - \$48,000	122	Negligible

6. Provide for a shuttle service in order to increase transit ridership

-1,733
Metric
Tons CO₂e

This reduction measure would implement a shuttle program that would connect areas not served by public transit to Caltrain. In 2003, The City conducted a pilot program of a limited door-to-door shuttle. The program grew rapidly, reaching a monthly ridership of 8,300, but has since been disbanded due to lack of funding. Survey results indicated out of 250 respondents, 77% noticed a reduction in traffic, 82% would financially support the program (included in that percentage were non-riders who are willing to pay for services), and 94% replied they would use the shuttle service in the future.

6.1. Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain

Currently, there are several shuttle services funded through public/private partnerships that serve the San Carlos Caltrain Station and link various employment sites. These shuttle commuter programs include the Electronic Arts Employer Shuttle, Oracle Employer Shuttle, and Redwood Shores (Bridge Park and Clipper) Employer Shuttles. These shuttles are funded jointly by the Bay Area Air Quality Management District Transportation Fund for Clean Air, Peninsula Corridor Joint Powers Board and the respective employers. Passengers pay a fare on the train but ride free on the Shuttle. Several other cities have also participated in public funding of commuter shuttles, including the cities of Menlo Park, East Palo Alto, and Burlingame.

A shuttle service under this reduction measure would coordinate with existing shuttle services in order to serve residents of San Carlos.

Initial Cost

According to CalTrans vehicle specifications, capital costs of a natural gas-fueled, medium-sized shuttle bus (14 passengers) are \$85,000. There would be approximately



14 one-way trips to and from the Caltrain station each weekday (based on current schedule for am/pm commuter trains). The estimated City weekday operating cost would be \$217, with annual operating costs of \$56,637, assuming 261 weekdays per year. Annual amortization of shuttle bus assuming a five year life would be \$17,000 and total annual shuttle cost would be \$73,637. In addition, there would be an estimated \$2,000-\$4,000 in costs generated by 40 hours of staff administration and start up time.

San Mateo County's Measure A provides an estimated \$450 million for transit improvements through 2033, or about 30% of the estimated total local transportation sales tax revenues. Approximately \$60 million, or 4% of the total sales tax revenues, will be used to provide local shuttle services to meet local mobility needs and access to regional transit services. An additional \$60 million in matching monies is anticipated,

bringing the program total to \$120 million over the next 25 years. This program for the operation of local shuttle services is sponsored by SamTrans and priority will be given to shuttle services which include a portion of the funding from businesses, employers and other private sector sources. Priority shall also be given to local services which connect with Caltrain, BART and future Ferry Terminals.

Costs to the City would include the \$2,000 - \$4,000 in coordination, the cost of which would be covered by Measure A monies, Caltrans grants, federal Department of Transportation technical assistance or other sources of funding through regional agencies or the State of California. With Measure A and corporate and business investment, operating costs are expected to be minimal.

Greenhouse Gas Emissions Reductions

Using data from the City pilot program, we estimate that a shuttle system in San Carlos would attract 500 new daily riders to public transit that weren't utilizing public transit before the shuttle service. This increased ridership is expected to decrease greenhouse gas emissions by at least 1,733 metric tons of CO₂e per year.⁴²

Table 20
Summary of Transportation and Land Use Reduction Measure 6

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain.	Negligible	1,733	Negligible
TOTAL		Negligible -	1,733	Negligible -

7. Promote car sharing programs

**-1,158
Metric
Tons CO₂e**

Car sharing programs like City Car Share in San Francisco, Oakland, El Cerrito and Berkeley allow participants to reserve vehicles online for a low hourly rate. Although users are still utilizing personal vehicles, it has been found that car sharing has a major impact on the travel behavior of its members by reducing the number and length of trips. Once members give up their personal cars, the car is no longer the default mode of travel and is therefore used less than a personally owned vehicle. Additionally, car share vehicles are often newer, more efficient models or hybrid vehicles.

7.1. See to the establishment of a car sharing program

It is likely that vehicle miles traveled (VMT) in San Carlos will decline if a car sharing program is established. In San Francisco, car share members' daily VMT (weekday/workday) fell from 2.80 to 1.49 miles while among the control group of non-

⁴² This estimate assumes an average of 9 people per shuttle bus and an average trip of 10 miles per person.

members, it rose from 5.45 to 20.85. These figures refer to second-year impacts; first-year impacts showed a net increase in VMT. In Arlington, VA members reported a reduction in VMT of 43%, or 3,250 miles per year. Forty-five percent of respondents reported reducing driving after joining car-sharing, while 35% said they increased their driving. Nearly half of respondents (49%) said they walk more often because of their involvement in car sharing, and 54% said they use transit more often.⁴³

Initial Cost

It is estimated that initial setup and coordination between City staff and the Car Share organization will cost 36 hours, or \$1,800 to \$3,600 of staff time.

Greenhouse Gas Emissions Reductions

It is estimated that a car share program in San Carlos would reduce greenhouse gas emissions by at least 1,158 metric tons of CO₂e per year. This estimate is assuming that a car share program would attract at least 1,000 members and that those members would reduce vehicles miles traveled by at least 30% as national studies of car share riders show. This estimate is also in conjunction with the next supporting measures as the two components depend on each other for success.

7.2. Provide parking spaces for car share vehicles at convenient locations accessible by public transportation

The success of a car sharing program depends on having easily accessible parking spaces within walking distance of public transit. Under this reduction measure, City staff would encourage developers to dedicate a portion of their parking to car share vehicles.



Initial Cost

The costs for signage and re-striping would be borne by the car sharing company. Costs to the City would be minimal and largely encompassed under the existing permitting process.

Greenhouse Gas Emissions Reductions

As stated above in the initial cost analysis of measure 7.1, this measure would reduce greenhouse gas emissions by 1,158 metric tons of CO₂e per year in conjunction with the first reduction measure.

⁴³ Cervero, Robert and Tsai, Yu-Hsin (2003). San Francisco City CarShare: TravelDemand Trends and Second-Year Impacts. University of California at Berkeley, Institute of Urban and Regional Development. Working Paper 2003-05.

Table 21
Summary of Transportation and Land Use Reduction Measure 7

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	See to the establishment of a car sharing program	\$1,800 to \$3,600	1,158	\$1.55 – \$3.11
2	Provide for car share parking spaces in convenient locations	Negligible		
TOTAL		\$1,800 - \$3,600	1,158	\$1.55 – \$3.11

8. Enforce affordable housing development standards

A mix of below market rate (BMR) and market-rate units has been proven to reduce vehicle miles traveled. Low income and senior citizens are much more likely to walk or bike to their destination, which can breed similar behavior in neighbors.

8.1. Continue to enforce the City's Below Market Rate (BMR) Ordinance (as amended) to support the development of affordable housing in the area

**-192
Metric
Tons CO₂e**

The City of San Carlos Below Market Rate (BMR) Housing Program was adopted by City Council on November 22, 2004. The ordinance requires a percentage of units in larger developments to be below market rate units. The specific levels of affordability are specified in the ordinance. In addition, there is a Partial-Unit Fee for those developments that trigger a partial unit of less than 0.5. A significant amount of evidence points to the fact that lower-income households and senior citizens own fewer vehicles and drive less. Continuation of the BMR ordinance will therefore result in decreased GHG emissions over time.

Initial Cost

The initial cost of this measure would be nominal as the BMR ordinance is already being implemented.

Greenhouse Gas Reduction

This reduction measure will reduce transportation-related greenhouse gas emissions by 95 Metric Tons CO₂e per year by 2020 and 192 metric tons per year by 2030. This estimate is based on San Carlos's current BMR ordinance, which requires 15% BMR units for every development over 7 units. Total housing growth based on the 2009 San Carlos Housing Element. VMT reduction for affordable units based on a study by

Nelson/Nygard transportation engineers and supported by the Sacramento and San Joaquin Valley Air Districts.

Table 22
Summary of Transportation and Land Use Reduction Measure 8

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Continue to enforce the City's Below Market Rate (BMR) Ordinance (as amended) to support the development of affordable housing in the area	Negligible	192	Negligible
TOTAL		Negligible	192	Negligible

9. Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles

**-59
Metric
Tons CO₂e**

This program would expand upon current efforts to replace traditional gas and diesel vehicles with hybrid or electric vehicles when a fleet vehicle is due for replacement.

Studies show that hybrid vehicles recoup their higher cost in 2-3 years.⁴⁴ They also emit 80% less harmful pollutants and greenhouse gases than comparable gasoline cars.⁴⁵ Electric cars have even greater benefits, although they are generally more expensive and require dedicated infrastructure for charging.

9.1. Replace 18 traditional automobiles in the City's fleet with hybrid, electric, alternative fuel, or smaller vehicles by 2020.

The City has approximately 18 vehicles between Public Works, Parks and Recreation, and Building Departments that have the possibility of being replaced in the future with alternative fuel or hybrid technology.

Initial Cost

The initial cost for purchasing a Toyota Prius for City use has a price range of \$21,430 for base model to \$23,036 for standard touring model. This assumes fleet price is \$500 above invoice and includes destination charge with no additional options. Assuming the City purchases 18 additional hybrid vehicles, the total cost to the City would be approximately \$385,740 to \$414,648. As an information item, a calculation provided in the CAPPA software shows that the City of San Carlos will recoup the added cost of buying hybrid vehicles within 2 years. Fleet replacement would occur over time as other fleet vehicles are retired. This would

⁴⁴ Hybrid Car Organization, www.hybrid-car.org, accessed Sept. 20, 2008.

⁴⁵ Carte, Sharon Silke. "Hybrids recoup higher cost in less time." USA Today, 5/12/2008, http://www.usatoday.com/money/autos/environment/2008-05-11-hybrids-gas-prices_N.htm.

not be a new cost, but rather an environmentally preferable purchasing standard.

Greenhouse Gas Reduction

The CAPPA software estimates that replacing 18 City fleet vehicles with hybrid vehicles would decrease greenhouse gas emissions by 59 metric tons of CO₂e annually.

Table 23
Summary of Transportation and Land Use Reduction Measure 9

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Replace 18 traditional automobiles in the City's fleet with hybrid, electric, or alternatively fueled vehicles.	\$385,740 - \$414,648	59	\$6,537 - \$7,027
TOTAL		\$385,740 - \$414,648	59	\$6,537 - \$7,027

10. Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles

**-49
Metric
Tons CO₂e**

The City of San Carlos can help promote the use of alternatively fueled and hybrid cars by making it easier for residents and businesses to own and operate such cars. For instance, residents may be willing to convert their diesel engines to biodiesel, however the nearest biodiesel stations to San Carlos are either in Mountain View or San Francisco.

The City does have a Compressed Natural Gas (CNG) station at the PG&E facility, however it has restricted access. In addition, a hydrogen refueling station is currently under construction as a part of the "Hydrogen Highway" program promoted by Governor Schwarzenegger, with anticipated completion in the next few years.

10.1. Offer prioritized parking for hybrid or alternative fuel cars on City streets

Under this reduction measure, select parking spots in convenient and well-trafficked public locations would be designated as "green" spaces only for hybrid, electric, or other alternatively fueled cars. The spaces would be much like handicapped spaces except that a placard would not be required for access. Proper use of the space would be enforced by local enforcement agencies or officers.

Initial Cost

This measure will consist of initial restriping for the selected priority parking spaces, which also is considered an ongoing public works task with a cost of \$100 per parking space. Another \$400 per parking space relating to enforcement of the designated priority spaces by proper cars is estimated. Therefore, assuming that 20 spaces are converted, we can estimate that the cost of this measure is approximately \$10,000.

Greenhouse Gas Emissions Reductions

It is unclear how prioritized parking for hybrid or alternative fuel cars will affect consumer behavior to purchase and drive these vehicles, therefore an estimate of emissions reductions cannot be made at this time.

10.2. Encourage siting of alternative fueling stations within close proximity to potential customers

Allowing for alternative fueling or electrical recharging stations near industrial or commercial areas utilizing large vehicle fleets will encourage these businesses to use alternative fuels. A prime example is biodiesel, which requires no substantial modifications to existing diesel engines yet emits 50% less speciated hydrocarbon emissions than measured for diesel fuel.⁴⁶

Initial Cost

The process of encouraging alternative fueling stations within San Carlos would largely be incorporated in the zoning code update effort following adoption of the General Plan update in 2009.

Greenhouse Gas Emissions Reductions

Based on the present amount of biodiesel Bay Area fueling stations distribute, we estimate that a biodiesel station in San Carlos would cause at least 1,000 gallons of pure biodiesel to be purchased and used per month. This equates to 19 metric tons of CO₂e, based on biodiesel produced from soybeans specifically for the use of biodiesel (not waste oil).⁴⁷

10.3. Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations

Initial Cost

The cost to the City for encouraging electric vehicle recharging stations is negligible. Most likely it would be incorporated into existing incentives and concessions for project approval. As a point of information, the cost to the developer is estimated to be five thousand dollars per lot for recharging stations, including equipment & installation initial cost.

Greenhouse Gas Emissions Reductions

Based on current research, it is estimated that 25 electrical vehicle recharging stations would cause a 30 metric ton decrease in CO₂e levels per year.

⁴⁶ National Biodiesel Board, "Biodiesel emissions factsheet," http://biodiesel.org/pdf_files/fuelfactsheets/emissions.pdf, accessed November 1, 2008.

⁴⁷ Estimate based on the sales of San Mateo Petroleum and adjusted by population and estimated increases in demand.

Table 24
Summary of Transportation and Land Use Reduction Measure 10

	Component	Initial Costs to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Offer prioritized parking for hybrid or alternative fuel cars on City streets.	\$10,000	Unknown	N/A
2	Encourage alternative fueling stations within close proximity to potential customers.	Negligible	19	Negligible
3	Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations.	Negligible	30	Negligible
TOTAL		\$10,000	49	\$200

Transportation and Land Use Reduction Measures – Progress to Date

Efforts to reduce transportation-related emissions are already underway in the City of San Carlos. In addition to hybrid vehicle purchases for the municipal fleet, the City is developing multiple traffic calming measures. The following analyzes San Carlos's progress in achieving the transportation and land use reduction targets outlined in this chapter.

Traffic Calming⁴⁸

Traffic calming measures such as traffic circles, bulbouts, and chokers help to reduce greenhouse gas emissions by lowering traffic speeds and improving the pedestrian and bicycle environment. The City's traffic calming policy was amended in 2004 to require the homeowners pay 100% of construction of traffic calming devices.

Following adoption of the policy and the budget, the following petitions were filed:

- 1) The residents of 2200 and 2300 blocks of Howard avenue for installation of a traffic circle at the intersection of Howard Avenue and Dayton Avenue
- 2) The residents of 700 block of Cordilleras Avenue for installation of two Chokers
- 3) The residents of 900 and 1000 blocks of Elm Street for installation of a Traffic Circle at the intersection of Elm Street and Morse BLVD
- 4) The residents of Magnolia Avenue for installation of a traffic circle and a choker at the intersection of Magnolia Avenue and Chestnut Street

⁴⁸ San Carlos City Council Staff Report, "Report on Traffic and Pedestrian Safety Efforts," dated December 11, 2006.

Following several neighborhood meetings and with recommendation from the Traffic Commission, the above projects were approved by the City Council and were constructed at no cost to homeowners.

It is estimated that this reduction effort will reduce emissions by **approximately 5 metric tons CO₂e**, which contributes directly to Reduction Measure 5 - Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.

Bike Lanes⁴⁹

Multiple bike lanes were installed during the period of 2005 to 2009, including those on the following streets:

- Brittan Avenue
- Alameda de las Pulgas in 2007
- Sharrows and Share the Road signs were installed on Cedar Street and Arroyo Ave in 2008
- Arroyo Ave: 3/4 miles of sharrow/share the road signage
- Cedar Street: 1.9 miles of sharrow/share the road signage

It is estimated that the bike lane installations since 2005 have saved **10 metric tons CO₂e**.

Curb Ramps

Funding has been approved through the American Recovery and Reinvestment Act of 2009 (aka the stimulus package) for the 2009 Pedestrian Improvement Project, which would complete 99 new curb ramps and 110 new crosswalks at the current level of funding. Construction would occur starting in summer 2009. It is estimated that these curb ramps will reduce transportation emissions by approximately **2 metric tons CO₂e**.

Hybrid Vehicles

The City of San Carlos has already begun to convert its vehicle fleet to hybrid and alternatively-fueled vehicles where possible. The police chief and building inspection department recently switched to hybrid vehicles and parking enforcement utilizes an electric utility vehicle. These two hybrids and one electric vehicle are estimated to reduce emissions by approximately **10 metric tons CO₂e** compared to business-as-usual.

⁴⁹ Communication with Robert Weil, City of San Carlos Public Works Director/Engineer, Feb. 23, 2009.

Analysis of Reduction Target – Transportation and Land Use

The 10 measures in this chapter help San Carlos achieve 48% emissions reductions by 2030 in combination with State initiatives such as the Pavley bill and the Low Carbon Fuel Standard discussed later in this document.

Table 25
Summary of Transportation and Land Use Emissions Reductions

	Metric Tons CO ₂ e per year
Reference year 2030 Transportation “Business-as-Usual” Emissions	195,016
1 Encourage development that is mixed-use, infill, and higher density.	- 5,544
1.1. Revise municipal codes to encourage and allow for mixed-use, infill, and high-density development.	
2 Increase housing density near transit.	- 4,957
2.1. Revise municipal codes to encourage and allow for higher density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of personal automobiles.	
3 Increase Bike Parking	- 125
3.1. Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience.	
3.2. Require large employers to provide facilities that encourage bicycle commuting, including shower facilities, and covered or indoor bicycle parking.	
4 Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.	- 170
4.1. Promote traffic calming methods on City streets such as landscaped median barriers and traffic circles.	
4.2. Establish clear and convenient pedestrian rights of way with shade and minimal tripping hazards.	
4.3. Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently being updated.	
4.4. Promote “Walk pools” or “Walking buses” to increase the number of students who walk to school.	
5 Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking.	- 122
5.1. Create a plan to identify and address barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see to the plan's implementation.	
5.2. Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location.	
5.3. Provide for an education program to residents and businesses as well as increased	

	Metric Tons CO ₂ e per year
Reference year 2030 Transportation “Business-as-Usual” Emissions	195,016
code enforcement in order to minimize vegetation that degrades access along public rights of way.	
6 Provide for a shuttle service in order to increase transit ridership.	- 1,733
6.1. Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain.	
7 Promote car sharing programs.	- 1,158
7.1. See to the establishment of a car sharing program.	
7.2. Provide parking spaces for car share vehicles at convenient locations accessible by public transportation.	
8 Enforce affordable housing requirements	- 192
8.1. Continue to enforce the City's Below Market Rate (BMR) Ordinance (as amended) to support the development of affordable housing in the area	
9 Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.	- 59
9.1. Replace 18 traditional automobiles in the City's fleet with hybrid vehicles.	
10 Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles.	- 49
10.1. Offer prioritized parking for hybrid or alternative fuel cars on City streets.	
10.2. Encourage siting of alternative fueling stations within close proximity to potential customers.	
10.3. Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations.	
Total Community Reduction	-14,109
Pavley I and II	-91,978
Low Carbon Fuel Standard	-10,304
Net community Transportation Emissions	78,625
Base Year 2005 Transportation Emissions	150,663
Percent below 2005 level	47.8%

It is also important to note that the Caltrain line is slated to become fully powered by electricity through the Caltrain Electrification Project. The Project would convert the Caltrain mainline between San Francisco and Gilroy from diesel-powered to solely electric-powered. Not only would travel time and frequency improve under the new system, but greenhouse gas emission levels would be greatly reduced. The conversion planning process is currently under environmental review. It is possible that San Carlos could achieve greater transportation and land use emissions reductions with greater regional and state cooperation. For now, the aforementioned reduction measures and their corresponding emissions reductions are a best effort under current technology and the limited ability of a municipal government. The effect of State initiatives is explored further in Chapter 7.

VI. Solid Waste Strategies

According to the California Integrated Waste Management Board, residents and businesses of San Carlos sent approximately 45,439 tons of waste to landfills in 2005. That is equivalent to 3,233 pounds of waste for every person in San Carlos.



As this landfill waste decomposes, methane gas is generated and released into the atmosphere, which is 21 times more potent than CO₂. The waste in landfills accounts for 4.8% of San Carlos' greenhouse gas emissions, or 12,777 metric tons of CO₂e.

The reduction measures of this chapter to reduce greenhouse gas emissions associated with solid waste generation are:

1. Support zero waste.
2. Increase recycling and composting at public events.
3. Increase overall waste diversion by 1% per year.

If San Carlos fails to implement the reach the targets included in this chapter, it is likely that emissions could increase by 12.4%, as shown below.

Table 26
Solid waste “Business-as-Usual”
Projected Emissions Growth (CO₂e per year)

Sector	2005	2020	2030	Percent change from 2005 to 2020
Waste	12,777	13,862	14,636	14.5%

Although emissions from solid waste are relatively small in comparison to those from transportation and energy use, the solid waste sector remains a viable option for reducing greenhouse gas emissions. The community has strong, direct power over their solid waste production, especially as recycling and composting services become more widely available under the City's new contract with Recology, which is explained in this chapter.

1. Support zero waste

**-510
Metric
Tons CO₂e**

The Zero Waste International Alliance broadly defines Zero Waste as a philosophy and visionary goal that emulates natural cycles, where outputs are simply an input for another process. Under a zero waste policy, everything would be recycled, minimal disposables would be allowed, and composting would be required. This would necessitate considerable cooperation with the local garbage and recycling collection firm as well as the South Bayside Waste Management Authority (SBWMA).

A zero waste policy would decrease the amount of waste sent to landfills, thus reducing the greenhouse gas emissions released from landfills. The majority of entities that have implemented zero waste policies at this time are large businesses, some of which may be comparable to the scale of San Carlos' municipal operations. According to the Zero Waste Alliance, Hewlett Packard in Roseville, CA reduced its waste by 95% and saved \$870,564 in 1998 through a zero waste policy. Interface, Inc. in Atlanta, GA has eliminated over \$90M in waste from a zero waste policy.⁵⁰



1.1. For municipal operations, establish a zero waste policy

Establishing a zero waste program for municipal operations would mean designing and managing goods and products to allow for the conservation, reuse, and recycling of resources instead of having them sent to a landfill. Specifically, the City would establish a detailed recycling, composting, and Staff education program that would ensure that at least 90% of materials were reused, recycled, or composted.

Initial Cost

A zero waste policy would require approximately 200 hours of Staff time per year for training, purchasing of receptacles, and coordinating with handlers, or approximately \$10,000 to \$20,000 depending on pay grade. City staff members are already spending this amount of time on coordination of recycling efforts, but this time would be shifted to the new zero waste policy and accompanying trainings. The startup of the program may require additional time the first year.

Greenhouse Gas Emissions Reductions

The San Carlos 2005 Municipal Inventory found that the City's municipal operations produce 93 metric tons of CO₂e per year from solid waste. An EPP policy would reduce this impact to approximately 9.3 metric tons, which is a reduction of 83.7 metric tons per year.

⁵⁰ Zero Waste Alliance, <http://www.zerowaste.org/case.htm#benefits>, accessed Sept. 30, 2008.

1.2. In support of Zero Waste, establish an environmentally preferable purchasing program (EPP) for government operations

Environmentally Preferable Purchasing, or EPP, refers to buying products and services with reduced effects on human health and the environment.⁵¹ An EPP policy would require that environmentally preferable products be purchased when possible and reasonable. For example, under an EPP, cleaning products would have recyclable packaging, contain low or no Volatile Organic Compounds (VOCs), and be free of ozone-depleting substances.

An EPP policy for local government operations would establish the government as an example for citizens to follow in order to decrease their greenhouse gas emissions. The City already purchases recycled paper, but expanding into carpets, building construction and other sectors is possible and often results in cost savings in the long run.

Initial Cost

City staff estimates that the initial cost for preparing an Environmentally Preferable Purchasing ordinance would be approximately \$5,000. There may be additional costs at the onset for quality control of new and unfamiliar products and their providers. There is also potential for higher material costs, although research is showing that the costs of environmentally preferable products are comparable with traditional products.

There are also significant cost-saving opportunities in the future for EPPs. Entering into a regional purchasing cooperative may reduce costs by allowing neighboring cities to buy sustainable products in bulk. Organizations like the State Regional Purchasing Cooperatives and Joint Venture Silicon Valley may be able to facilitate or aid in a program such as this.

Greenhouse Gas Emissions Reductions

An EPP would make zero waste possible; therefore it is included in the previous reduction estimate of 83.7 metric tons per year.

Table 27
Summary of Solid Waste Reduction Measure 1

	Component	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	For municipal operations, adopt a zero waste policy	Negligible	83.7	\$59.73
2	In support of Zero Waste, establish an environmentally preferable purchasing program (EPP) for government operations	\$5,000		
TOTAL		\$5,000	83.7	\$59.73

⁵¹ Pacific Northwest Pollution Resource Center (PPRC), http://www.pprc.org/pubs/epp/epp_report.cfm

2. Increase recycling and composting at public events

**-225
Metric
Tons CO₂e**

Public events are notorious for excessive packaging and the use of disposable utensils, plates, and cups. California law (AB 2176) already requires large public venues and special events to develop and implement solid waste management plans.⁵² This measure, therefore, would only be for events held in public areas such as street fairs and park events. The City of San Francisco passed a public event waste ordinance requiring recycling at special events. This, along with their ban on polystyrene food service ware, helped the city achieve a 70% waste diversion rate in 2006.



2.1. Require recycling and composting as a condition of approval for public events

This measure would make public event permits conditional upon a waste plan. The City already requires recycling of public event permit holders as practice, but this reduction measure would ensure that it is enforced as law and that composting also be required for approval. The event holder would have to agree to divert a certain amount of waste through recycling and composting in order to be awarded the permit.

Initial Cost

An additional two hours of staff time (\$100-\$200) per public event contract would be necessary under this reduction measure. This includes informing and monitoring recycling and composting opportunities at the applicants' events. The costs of recycling and composting would be incurred by the event holder, not the City. There would likely be a one-time start up cost for staff training, but since a similar practice is already in place, the new training would be minimal.

According to City records, approximately 25 public events occur annually in the City of San Carlos. Therefore, an estimated \$2,500 - \$5,000 is foreseeable to implement this measure; however this cost would be borne by the applicant.

Greenhouse Gas Emissions Reductions

Requiring recycling and composting at public events would increase overall waste diverted from landfills by an estimated 2%. This diversion rate yields a 255 metric ton CO₂e reduction from 2005 levels.

⁵² US EPA, "Recycling on the Go Success Story," <http://epa.gov/osw/conserve/rrr/rogo/documents/sf-ca-ord.pdf>, accessed Sept. 30, 2008.

Table 28
Summary of Solid Waste Reduction Measure 2

	Supporting measure	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Require recycling and composting as a condition of approval for public events.	Negligible	255	Negligible
TOTAL		Negligible	255	Negligible

3. Increase overall waste diversion by at least 1% per year

**-6,373
Metric
Tons CO₂e**

Increasing the amount of waste that goes into the recycling and compost stream instead of landfills will reduce the amount of methane, a potent greenhouse gas, released into the atmosphere. According to the Natural Resources Defense Council, 60% of household waste produced in the United States is recyclable or compostable.⁵³ Despite this fact, San Carlos residents and businesses only diverted 39% of their waste from landfills in 2006.⁵⁴

3.1. Increase required Construction and Demolition (C&D) diversion rate to 60%

C&D materials can include lumber, paper, cardboard, metals, masonry, carpet, plastic, pipe, drywall, rocks, dirt, and green waste related to land development.⁵⁵ San Carlos adopted a construction and demolition debris diversion ordinance that required 60% diversion (Zoning Ordinance Chp 8.05) in 2000. It requires a construction and demolition permit applicant to address their waste before the permit is approved. There are also minimum amounts of the waste that must be recycled or reused according to type.

Staff recently instituted process changes for the C&D ordinance to increase diversion to the goal of 60%. These changes make it more likely that the City will get 60% diversion through enforcement of the C&D ordinance and by encouraging material salvage.

According to the California Integrated Waste Management Board, Construction and Demolition materials account for 10.4% of business disposal. A stricter ordinance would reduce this number and help San Carlos achieve it's 1% per year diversion goal. Additionally, recycling or reusing C&D material is often less expensive than disposing of it. Organizations such as RecycleWorks have instruction manuals on how to recycle or find reuse for almost all materials.

⁵³ Natural Resources Defense Council, "The Past, Present, and Future of Recycling." <http://www.nrdc.org/cities/recycling/fover.asp>, accessed October 13, 2008.

⁵⁴ California Integrated Waste Management Board (CIWMB) Diversion Rate Statistics for Cities in San Mateo County, <http://www.ciwmb.ca.gov/LGTools/MARS/JurDrSta.asp?VW=ln>. Accessed October 14, 2008.

⁵⁵ South Bayside Waste Management Authority, www.rethinkwaste.org

Initial Cost

The City of San Carlos is already well on its way to preparing for increased waste diversion. A consultant has been hired to address the C&D waste diversion ordinance and prepare a more stringent program. This extra effort for C&D recycling is currently funded through garbage rates, but it may be funded in the future through C&D permit fee add-ons. The additional counter work would most likely be absorbed by applicants for a construction or demolition permit.

Greenhouse Gas Emissions Reductions

It is estimated that a more restrictive C&D ordinance, along with the next measure and previously planned improvements to waste collection would increase waste diversion by 1% per year. A 1% increase per year as compared to the previous year (compounded) would bring San Carlos' total waste diversion rate to over 70% by 2030. It is estimated that this reduction measure will decrease greenhouse gas emissions by approximately 6,222 metric tons of CO₂ equivalent.

3.2. Provide for expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings

Although there are many sources of waste in San Carlos, concentrating on large waste sources like C&D and multi-family residential buildings will be most cost effective in attaining our 1% a year waste diversion goal.

Multi-family houses, especially those that are renter-occupied, often do not offer recycling, green waste, or composting services. There is a need for outreach to property managers and landlords about the cost-savings and environmental benefits of waste diversion. Additionally, residents of multi-family buildings could be urged to ask their landlords for these services.



Expanded outreach to the residents of San Carlos is underway concerning recycling and composting services. In October 2008, City Council directed Staff to begin negotiations with Recology of San Mateo County to become the new Solid Waste, Recycling and Organics Collection firm in San Carlos starting on January 1, 2011. As part the agreement, Recology will be providing a six month recycling publicity program to advertise their new programs. They will also do ongoing outreach and public education as part of their contract with the City.

Initial Cost

As a result of the recent contract with Recology (see page 82 for details), the initial cost to the City for this reduction measure is expected to be negligible.

Greenhouse Gas Emissions Reductions

It is estimated that this measure, along with the previous measure and previously planned improvements to waste collection would increase waste diversion by 1% per

year. A 1% increase per year as compared to the previous year (compounded) would bring San Carlos' total waste diversion rate to over 70% by 2030. It is estimated that this reduction measure will decrease greenhouse gas emissions by approximately 6,222 metric tons of CO₂ equivalent.⁵⁶

3.3. Mandate commercial recycling

The California Integrated Waste Management Board (CIWMB) waste stream profile for San Carlos indicates that 63% of the City's waste comes from commercial properties. Mandatory recycling for daily commercial activities would greatly reduce this percentage, therefore reducing the amount of methane released from landfills.

It is likely that commercial recycling will become mandatory in the near future under the AB 32 Scoping Plan. The preliminary draft recommendations, approved in January 2009, clearly state that the Air Resources Board and CIWMB are considering mandatory programs to increase commercial recycling through local government partnerships.

A mandatory commercial recycling program would require enforcement. Local enforcement agencies or officers would partner with the waste management provider to identify businesses with improperly sorted waste. Enforcement and coordination would be funded by the money generated from fines to commercial properties.

Initial Cost

Costs to mandate commercial recycling would be minimal. The 2011 service contract with Recology is assumed to have capacity for increased commercial recycling.

Greenhouse Gas Emissions Reduction

It is estimated that mandatory commercial recycling within the City of San Carlos would ensure that San Carlos' waste diversion rate reaches over 60% by 2020. This diversion rate would meet, if not exceed, the future State target for overall waste diversion which is now at 50%.

Table 29
Summary of Solid Waste Reduction Measure 3

	Supporting measure	Initial Cost to the City	GHG Reduction (metric tons CO ₂ e / year)	Cost per metric ton CO ₂ e
1	Increase required Construction and Demolition (C&D) diversion rate beyond the 50% currently required by the State.	Negligible	6,222	Negligible
2	Provide for expanded recycling outreach and services to multi-family residential buildings	Negligible		
3	Mandate commercial recycling	Negligible		
TOTAL		Negligible	6,222	Negligible

⁵⁶ Based on a compound interest rate of 1% from 2020 solid waste projections.

Solid Waste Reduction Measures – Progress to Date

San Carlos has taken a proactive approach to reducing waste and increasing waste diversion among residents and businesses. This section describes San Carlos's progress to date in achieving the reduction targets of the measures in this chapter.

Recology Waste Contract

At the October 13, 2008 meeting, the City Council approved a resolution to begin negotiations with Recology (formerly, Recology Systems) of San Mateo County to become the new Solid Waste, Recycling and Organics Collection firm in San Carlos starting on January 1, 2011. Recology was chosen as the City's new provider in part because of its expanded composting, recycling, and outreach services that will help reduce greenhouse gas emissions levels within the City of San Carlos. Specifically, Recology offers the following with respect to waste reduction:



1. The company pioneered Commercial Organics Recycling Collection Service in Northern California and is highly committed to diversion from all service sectors.
2. Recology's proposal includes the high levels of diversion and is specifically strong in the area of Commercial Recycling and Organics Collection Service and in the On-Call (Bulky Items) Collection Service. The company has put forth an aggressive, yet achievable Commercial Recycling diversion goal and innovative approach to attain the desired results.
3. Recology's proposal included environmental enhancements including the use of B-40 fuel (40% bio diesel), regular carbon footprint monitoring and reporting, use of hybrid trucks for route supervisors, and incorporating green building practices and standards at its facilities.
4. Recology will provide a free 6 month Commercial and Multi-Family Dwelling "Recycling Blitz" educational program (estimated to cost \$478,435) and will remit to the SBWMA Member Agencies the revenue derived from the recyclable material that is collected during this program (estimated at \$210,000).

This contract will play an essential role in reducing emissions by the amount set forth in this plan. The "Recycling Blitz" is already in the planning stages.

Construction & Demolition (C&D) Ordinance

As mentioned previously, City staff is instituting process improvements to the C&D ordinance with a 60% diversion goal. The process improvements make it more likely we will get 60% diversion through the C&D ordinance enforcement and the salvage of materials. The C&D ordinance is expected to be crucial to reaching a 1% diversion increase per year for an overall goal of over 70% by 2030.

Analysis of Reduction Target – Solid Waste

With the four reduction measures described in this chapter, San Carlos would reduce its solid waste emissions by 36.8%.

Table 30
Summary of Solid Waste Emissions Reductions

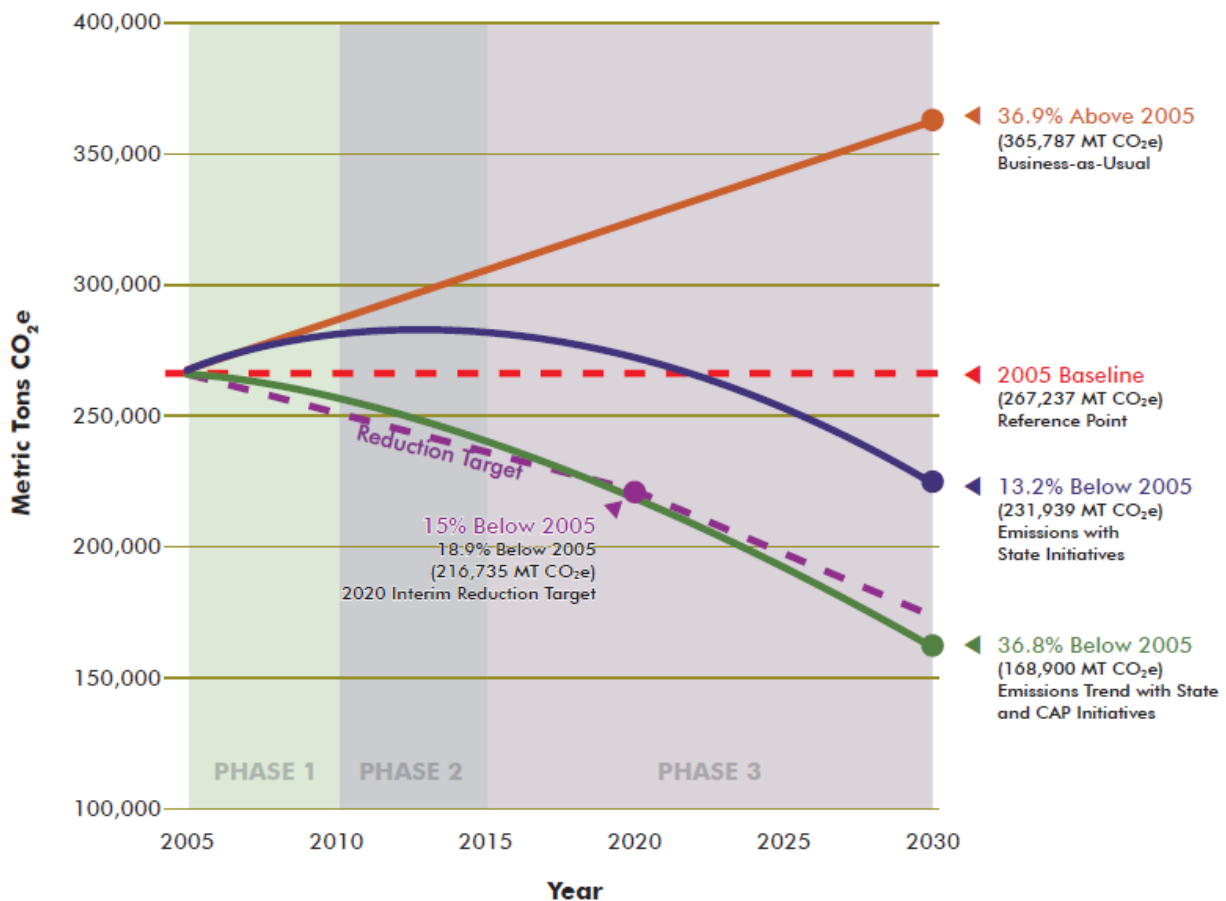
		Metric Tons CO ₂ e per year
Reference year 2030 “Business as Usual” Solid Waste Projection		14,636
1	Promote zero waste.	- 83.7
	1.1. For municipal operations, establish a zero waste policy	
	1.2. Create an Environmentally Preferable Purchasing Policy (EPP) for municipal operations.	
2	Require recycling and composting as a condition of approval for public events.	- 255
	2.1. Require recycling and composting as a condition of approval for public events.	
3	Increase overall waste diversion by at least 1% per year.	- 6,222
	3.1. Increase required Construction and Demolition (C&D) diversion rate beyond the 50% currently required by the State.	
	3.2. Provide for expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.	
	3.3. Mandate commercial recycling	
Total Community Reduction		-6,560.7
Net Community Waste Emissions		8,075.3
Base Year 2005 Solid Waste Emissions (reference)		12,777
Percent below 2005 level		36.8%

VII. Reduction Target Analysis

Job, household, and population growth will weigh against City, State, and regional reduction activities in our effort to see that San Carlos's emissions are 35% below 2005 levels by 2030. This chapter analyzes how these growth factors and reduction efforts affect one another and how they culminate in our estimated 2030 emissions scenario shown in Figure 13 below.

As discussed earlier in this document, if the San Carlos community continues to produce greenhouse gas emissions at the same rate as 2005, our annual emissions will reach 365,787 metric tons of CO₂e by 2030. This 'business-as-usual' linear projection, shown by the red line in Figure 11 below, is a 36.9% increase above 2005 levels due to population, job, and household growth as well as projected increases in consumption.

Figure 13
2030 Emissions Reductions in San Carlos



While we implement the Measures of this document, emissions will continue to rise along this 'business-as-usual' projection. As such, the emissions reductions analyzed in this chapter are subtracted from the business-as-usual projection and not the baseline. Subtracting our reduction efforts from 2005 levels would be assuming that time stops while this Plan and State initiatives are implemented. In reality, our efforts will be implemented while emissions are still increasing in San Carlos. This fact makes our

reduction target of 35% below 2005 levels more challenging, yet still feasible; the percent change from 'business-as-usual' in 2030 to 35% below 2005 levels is over 70%. These trends are shown in Figure 13 above.

The reduction measures in this Plan will be implemented in phases due to financial, technical, or political obstacles and constraints. The curved lines in the graph above were formed by subtracting the greenhouse gas savings of each reduction measure from the projected emissions in the time period in which it is expected to be implemented. The result is a curvilinear trend towards expected emissions levels. These phases of implementation are explained further in this chapter and in the Implementation chapter.

State Initiatives: An Integral Partner in Our Reduction Efforts

Local governments can only do so much as they have minimal control over the transportation and energy sector. The majority of our future emissions depend on State, Federal, and regional efforts to affect the efficiency of vehicles, fuels, electricity, and natural gas. The waste sector remains the one sector in which our local governments have a large influence, which is demonstrated by our estimated 43% reduction from 2005 levels in the waste sector by 2030. The following sections describe and analyze the major State emission reduction efforts including the Renewable Portfolio Standard (RPS), Pavley bill, Title 24, Low-Carbon Fuel Standard, and SB 375.

Regional Portfolio Standard (RPS)

The State of California Renewable Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. Established in 2002 in Senate Bill 1078, the RPS program requires electricity providers to increase the portion of energy that comes from renewable sources to 20% by 2010 and by 33% by 2020. Per the trend of Executive Order S-14-08, this renewable energy goal is assumed to increase to 50% by 2030.

Assuming a constant distribution of natural gas and electricity use, the California RPS will reduce emissions by approximately 13,834 metric tons CO₂e by 2020 and 31,566 metric tons CO₂e by 2030. According to the California Public Utilities Commission, renewable energy constituted 13.5% of PG&E's electricity mix in 2005.

Assembly Bill 1493 (Pavley) I and II

Assembly Bill 1493 (Pavley), signed into law in 2002, will require carmakers to reduce greenhouse gas emissions from new passenger cars and light trucks beginning in 2011. The California Air Resources Board adopted regulations in September 2004 that create two phases of increasingly stringent standards for car manufacturers between 2009 and 2020. It is expected that new vehicles sold in California will create an average of 16% less greenhouse gas emissions than current models. The bill is being challenged in federal and state courts by automakers and car dealers. It is anticipated that the EPA waiver will be granted in 2009 and the State will be allowed to move forward as outlined in AB 1493.

Pavley I and II are expected to reduce transportation emissions within the City of San Carlos by 34,649 metric tons CO₂e by 2020 and 31,566 metric tons CO₂e by 2030. This estimate is based on the vehicle efficiency rates included in a technical assessment prepared by the California Air Resources Board.⁵⁷ The future vehicle mix in San Carlos was obtained using the EMFAC software. Pavley efficiency rates were then applied to each model year in 2020 and 2030.

Low-Carbon Fuel Standard

The Low Carbon Fuel Standard (LCFS) is a flexible performance standard designed to accelerate the availability and diversity of low-carbon fuels by taking into consideration the full life-cycle of greenhouse gas emissions. The LCFS will reduce emissions and make our economy more resilient to future petroleum price volatility.⁵⁸

As part of the AB 32 Scoping Plan, the LCFS is expected to reduce the intensity of transportation fuels by 10%. This will result in an estimated 14,124 metric tons in reductions by 2020 and 10,304 metric tons in 2030. The amount of CO₂e reduced actually lowers from 2020 to 2030 because the increase in vehicles subject to the Pavley bill.

Senate Bill 375

Senate Bill 375 aims to reduce greenhouse gas emissions by linking transportation funding to land use planning. The bill requires Metropolitan Planning Organizations like MTC to create sustainable communities strategies in their regional transportation plans (RTPs) for the purpose of reducing suburban sprawl. It also creates incentives for implementation of the sustainable communities' strategies and sustainable transportation plans.

The Scoping Plan also estimates a 5 million metric ton reduction as a result of the regional targets set by SB 375. This number represents an estimate of what may be achieved from local land use changes, not the SB 375 regional target. ARB will establish regional targets for each Metropolitan Planning Organization (MPO) region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

Although SB 375 is expected to reduce trips and transportation-related emissions, it is not quantified as a reduction source in this Plan for two reasons: 1) The intent and implementation of SB 375 overlaps greatly with the current mixed use and transit-oriented development measures included in this Plan and 2) A technical, defensible analysis of the bill's projected impact on the State or San Carlos area is not available at this time.

⁵⁷ Percentage reduction in Co₂e per model year derived from California Air Resources Board; An Enhanced Technical Assessment. "Comparison of Greenhouse Gas Reductions for the United States and Canada Under U.S. Café Standards and California Air Resources Board Greenhouse Gas Regulations." Table 11, Page 13: "CO₂-Equivalent Emission Reductions from Adopted Pavley 1 and Anticipated Pavley 2 Regulations in California in 2020."

⁵⁸ AB 32 Scoping Plan, Page 19.

Table 31
Emission Reduction Analysis from State Initiatives

		2020 Metric Tons CO ₂ e per year	2030 Metric Tons CO ₂ e per year
Business-as-Usual Projection		321,519	365,787
1	Renewable Portfolio Standard	- 13,834	- 31,566
2	Pavley I and II	- 34,649	- 91,978
3	Low Carbon Fuel Standard	- 14,124	-10,304
Total Reductions		-62,607	-136,794
Net Emissions		258,912	228,993
Base Year 2005 Community Emissions		267,237	267,237
Percent below 2005 Level		3.1%	14.3%

Climate Action Plan Reductions

Table 32 below shows the quantifiable reduction measures included in this plan in conjunction with the estimated results of State initiatives.

Table 32
Reduction Target Analysis

		2020 Metric Tons CO ₂ e per year	2030 Metric Tons CO ₂ e per year
Reference Year Business-As-Usual Emissions Projection		321,519	365,787
1	Energy Use Strategies	-24,496	- 42,369
2	Transportation and Land Use Strategies	-12,886	-14,109
3	Solid Waste	-4,815	-6,561
Subtotal – Emissions with CAP		279,342	302,748
4	Renewable Portfolio Standard	- 13,834	- 31,566
5	Pavley I and II	- 34,649	- 91,978
6	Low Carbon Fuel Standard	- 14,124	-10,304
Total – Emissions with CAP and State Programs		216,735	168,900
Base Year 2005 Community Emissions		267,237	267,237
Percent below 2005 Level		18.9%%	36.8%

With this Plan, San Carlos is making a proactive effort to reducing climate change locally. By implementing this Plan, San Carlos will ensure that greenhouse gas emissions meet, if not exceed, local and State reduction targets.

Challenges in analyzing San Carlos' future emissions

There are two main challenges in analyzing San Carlos' future emissions. As described in this Plan, not all reduction measures can be quantified in terms of greenhouse gas emissions. This report makes a best effort at estimating possible minimum levels of reduction, but it is more than likely that our analysis did not capture the results of all efforts to be made within the City by 2030. As more research is released and climate action plans become more common, it is likely that a better methodology for calculating emissions reductions will become available therefore reducing our future emissions level even further below what is currently projected.

VIII. Adaptation to Climate Change

Even in a “best case” scenario, the effects of climate change are likely to negatively impact San Carlos. It is therefore prudent that the City and community be prepared for the known and unknown consequences of climate change. Waiting for these impacts to become more severe before responding or having an established method of response will only put the City at an economic and social disadvantage to other Cities in the region that are proactively addressing climate change.



The known consequences of climate change, as discussed in the introduction chapter, include sea level rise, increased risk of wildfires, an increase in unpredictable weather, negative impacts on wildlife, a deterioration of public health, and a decrease in the consistent supply of fresh water. To address these impacts, the following adaptation strategies are recommended:

1. Identify and reassess regional climate change vulnerabilities on a regular basis and work with neighboring cities, counties and regional agencies to establish more uniform approaches to addressing climate change.
2. Evaluate the potential climate change impacts of items being considered by the Planning Commission, City Council, and other discretionary hearing bodies.
3. Prepare for sea level rise by cooperating with the San Francisco Bay Conservation and Development Commission (BCDC) and other regional agencies preparing for sea level rise, coastal erosion, and peak storm events.
4. Address barriers to change and inefficiencies within the existing structure of City government in order to be able to respond quickly to climate change developments. Incorporate climate change threats to the City's existing Emergency Incident Plan and Emergency Operations Center (EOC) training for City staff

It is important that San Carlos prepare for climate change not only within its borders, but within the region as a whole. Creating partnerships with bordering cities, the County of San Mateo, and agencies such as BCDC, ABAG, and MTC will ensure the safety of our region as a whole. It is also important to maintain consistency with State adaptation efforts. Climate change adaptation has recently become a priority at the State level through Executive Order S-13-08 signed by Governor Schwarzenegger in November 2008. The mandate initiates the development of a California Climate Adaptation Strategy (CAS) to be completed in 2009. The Plan will identify climate change vulnerabilities resulting from sea level rise, increased temperatures, shifting precipitation, and extreme weather events and recommend methods and policies to adapt to these

changes. The Order also directs State agencies to analyze existing and planned infrastructure projects that could be at risk to sea level rise.⁵⁹ By coordinating regionally and cooperating with State adaptation efforts, San Carlos will preserve the quality of life residents of the City enjoy now.

1. Identify and reassess regional climate change vulnerabilities on a regular basis

New and more accurate climate change information is being developed and released each day. In order to adequately stay prepared, the City must reassess its regional climate change vulnerabilities on a regular basis and modify its actions accordingly.

This process could be done in combination with the Climate Action Plan update, which is recommended every five years. It has become industry practice to assume re-evaluation of the community's emissions every 5 years. For San Carlos, and most neighboring Cities, that means preparing updated baselines in 2010, 2015 and 2020, with climate action plan updates occurring in 2012, 2017, and 2022.

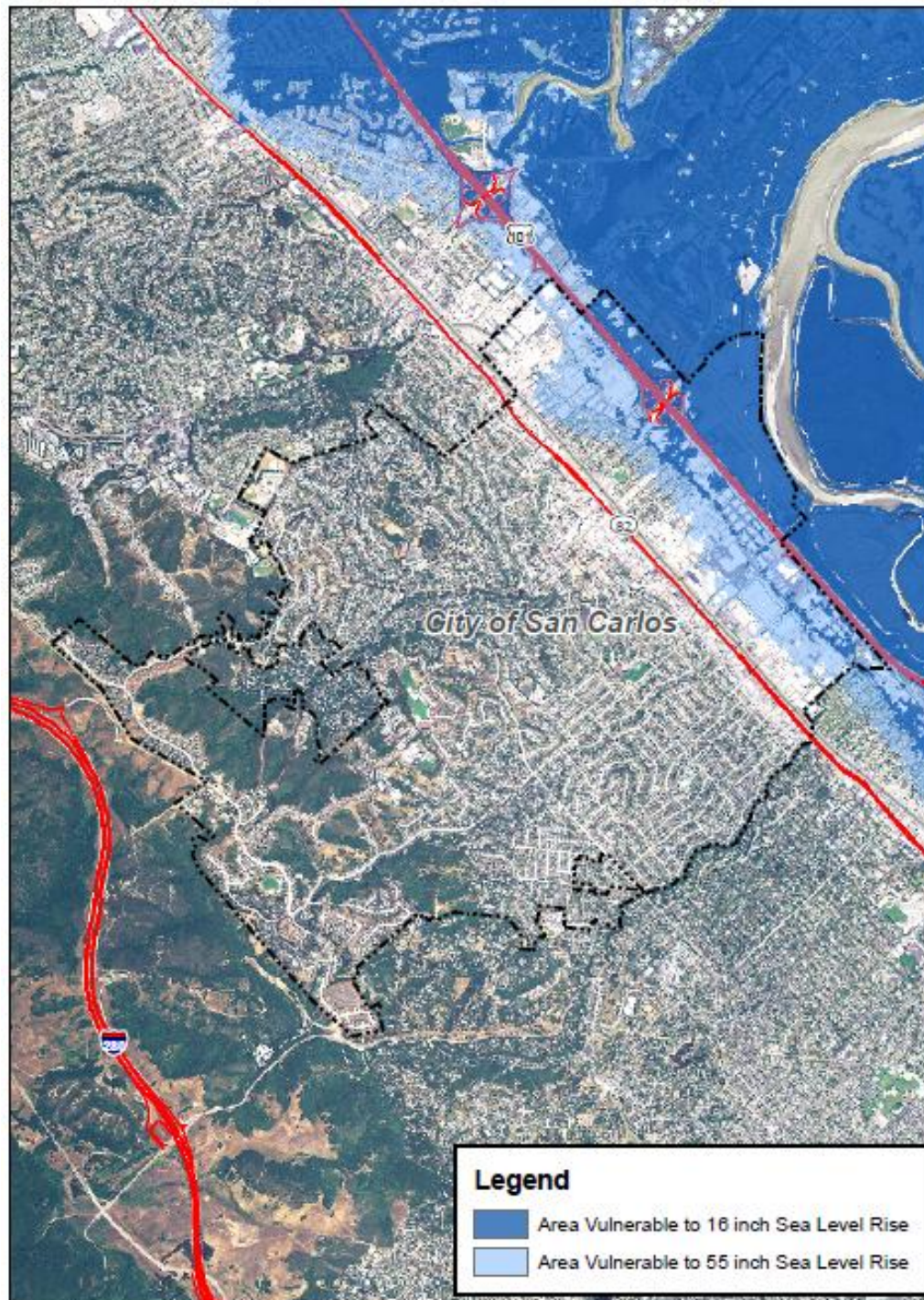
The purpose of re-evaluating the community's emissions is to understand how the reduction measures are working, and to provide an opportunity to develop alternatives to reduction measures that are found to be ineffective or too costly for the emission reductions obtained from the measures. This process will allow adaptive management of the climate action plan and emission reduction measures leading to a more effective resolution to the challenge of climate change.

2. Evaluate the potential climate change impacts of items being considered by the Planning Commission, City Council, and other discretionary hearing bodies

Climate change is a serious threat to the community of San Carlos, with potential economic and social ramifications that could result in fiscal impacts to the City's general fund. Consistency with state goals regarding reduction of greenhouse gas emissions will likely open sources of funding that the City could use to expand or maintain climate programs and other outreach programs. Approving programs and developments that address climate change consistent with this climate action plan and, as a result, State goals regarding climate change will result in more sustainable communities that provide healthier living conditions, fewer pollutants, less waste and a better quality of life. These evaluations would be similar to the 'fiscal impact' analysis already required in Council reports. Climate change evaluations in discretionary decisions will guarantee that the community and City of San Carlos is continuously conscious of our changing environment. It will also keep the goals and recommendations of this report alive and in the forefront of the decision making process.

⁵⁹ Office of the Governor press release, Gov. Schwarzenegger Issues Executive Order Directing State Agencies to Plan for Sea Level Rise and Climate Impacts, November 14, 2008. <http://gov.ca.gov/press-release/11035/>

Figure 14
Estimated Inundation Levels from Sea Level Rise on the South Bay



Source: BCDC, 2009

3. Prepare for sea level rise by cooperating with the San Francisco Bay Conservation and Development Commission (BCDC) and other regional agencies preparing for coastal inundation⁶⁰

Sea level rise is perhaps the most visible and threatening consequence of climate change to the City of San Carlos. BCDC issued a report on sea level rise in April, 2009, which states that sea level along the west coast rises approximately 7.9 inches per century, or approximately 0.08 inches per year. However, the rate of sea level rise is increasing. During the period of 1993-2003, the rate was approximately 0.12 inches per year, which could demonstrate the result of human-induced warming on sea level. The BCDC uses the same sea level rise estimates that are used by California Climate Action Team-funded assessments. These estimates anticipate the sea level in the Bay Area will rise 16 inches by mid-century and 55 inches by the end of the century as shown in Figure 12.

By mid-century, approximately 180,000 acres of the Bay Area could be flooded and 213,000 acres could be flooded by the end of the century. Due to Bay Area topography 100 percent of the development located in 100-year flood plain areas will likely flood by the year 2050. Also, different parts of the Bay Area are more vulnerable to flooding than others. In particular, due to differing tides, the South Bay will likely experience amplified storm surge events. In the vulnerable areas are several large commercial and industrial developments, including 93 percent of both the Oakland and the San Francisco airports that may be inundated by 2100. Half of the vulnerable development is residential and approximately 270,000 people would be at risk of flooding. Approximately 4,300 acres of waterfront parts are expected to flood by 2100.

Given the scale and potential severity of sea level rise impacts, it is important that the coordination and preparation be a region-wide effort. It is recommended that San Carlos participate in and cooperate with efforts like BCDC's in order to protect its own borders, property owners, and neighbors.

4. Address barriers to change and inefficiencies within the existing structure of City government in order to be able to respond quickly to climate change developments. Incorporate climate change threats to the City's existing Emergency Incident Plan and Emergency Operations Center (EOC) training for City staff

Due to the projected increase in peak storm events, along with associated impacts of storm surges exacerbated by sea level rise, adequate preparation will be essential in order to keep the community safe and prepared for these types of situations. In an emergency, there can be inherent difficulties with communication and coordination between a multitude of agencies. By identifying these inefficiencies and preparing a course of action, the City can be better prepared to escalate issues throughout the City government when the need arises. A secondary benefit to improving emergency

⁶⁰ San Francisco Bay Conservation and Development Commission. 2009. (April) Draft Staff Report. *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*. http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf. Accessed June 5, 2009.

response and planning will be the general improvement of emergency preparedness within the City and the community.

One of the primary barriers to implementing climate change reduction measures is a lack of understanding of climate change and its importance in the long term viability of the community. Educating City staff, decision makers, and the public about the risks of climate change and the efforts the City is taking will prepare the City and the community for potential climate related events and the appropriate response to these events. Incorporating climate change education into the existing Emergency Incident training given to City staff should be one major component of this adaptation strategy.

Implementation of Climate Change Adaptation Strategies

Unlike the reduction measures described previously in this document, these four adaptation measures described in this chapter do not include a cost-benefit analysis of greenhouse gas emissions reductions as these are not meant to address our contribution to climate change, but rather our response to the effects of climate change. Many of the processes involved in adaptation efforts can be done in conjunction with existing processes and would not involve substantial cost. Grant funding will likely become available in the next few years to develop climate emergency preparedness plans and response plans in coordination with regional programs to reduce the long term risks of climate change on Bay Area communities. These adaptation measures are an essential part of ensuring the City is proactively prepared for climate change and a way to ensure that the City as a whole maintains its awareness of climate change in its day to day operations.

IX. Public Outreach and Education

A Climate Action Plan can be more effective if the community is aware of its purpose and reduction measures. Resident participation is essential to many of the reduction measures included in this plan if we are to achieve the predicted emissions reductions. The voice of few may have begun the movement to prepare this plan, but it will take the actions of many to see it through implementation.

This chapter outlines three levels of engaging the public in climate action efforts. Descriptions and cost estimates are based on similar scopes of work and budgets prepared by consultants.

Level 1: Minimal Public Outreach and Education

The goal of a level one public outreach and education effort would be to inform the community that the City has developed a Climate Action Plan and will be implementing its measures. It would involve a short four-week campaign consisting of local media outreach, including press releases, a printed FAQ (frequently asked question) sheet and the addition of one page promoting the Plan on the City web site. The cost of this level of outreach is estimated to be \$6,000 through the use of internal staff or outside consultants.

Level 2: Moderate Public Outreach and Education

The goal of a level two public outreach and education effort would be to inform the community of the Climate Action Plan, what its conservation goals are, and how the public can participate in them. It would require a six-month campaign that includes the following outreach components:

- ❏ Development of a campaign motto that represents the goals of the CAP.
- ❏ Local media outreach, including multiple press releases, a media kit and media pitching.
- ❏ Development of a campaign web site that includes information on the CAP, conservation tips, optional online survey and frequently asked questions. The site would be branded to match the City's current site.
- ❏ Staffed participation at two City-sponsored community events, including development of a booth.
- ❏ Development of printed promotional collateral pieces (brochure, FAQ, etc.)
- ❏ Development of a Speaker's Bureau to conduct presentations on the program at important community based organization meetings (Chamber of Commerce, civic and environmental organizations, faith based organizations, etc.).

The cost of this level of campaign would be approximately \$36,000.00 the first year, and less in later years. The first year of implementation would likely use the services of an outside consultant.

Level 3: Comprehensive Public Outreach and Education

A level three public outreach and education campaign would be to educate the community about conservation activities they can participate in that are enforced or recommended by the CAP. It would entail a comprehensive one-year campaign that would target the business community, school system, and residents.

The following outreach components could be included:

- ✚ Development of a unique campaign brand that represents the conservation goals of the CAP.
- ✚ Creation of a series of four community-based events that promote residential conservation (for example composting or water conservation workshops).
- ✚ A membership campaign for businesses who participate in conservation efforts. Those efforts are identified to the public through branded window decals and a membership card that provides a 10 percent discount to customers.
- ✚ School outreach will include a teacher's guide that can be used in elementary schools and high schools.
- ✚ Local media outreach, including multiple press releases, a media kit and media pitching.
- ✚ Development of a campaign web site (up to 6 pages) that includes information on the CAP, conservation tips, optional online survey and frequently asked questions. The site would be branded to match the City's current site.
- ✚ Development of printed promotional collateral pieces (brochure, FAQ, etc.).
- ✚ Development of a Speaker's Bureau to conduct presentations on the program at important community based organization meetings (Chamber of Commerce, civic and environmental organizations, faith based organizations, schools, etc.)
- ✚ Develop utility bill insert touting the campaign with conservation tips to residents.

A comprehensive public outreach and education program would cost an estimated \$60,000 per year for an outside consultant to develop and administer for the first year. Costs to manage the program after the first year would vary depending on whether external assistance is used or whether in house staff manages the program.



Example: City of San Mateo, Climate Action Plan Public Outreach Program

The City of San Mateo developed the San Mateo Acting Responsibly Together (SMART) program to educate residents and businesses on the City's Sustainable Initiatives Plan. It is anticipated that the program will increase awareness and behavioral changes in individual energy consumption, waste production, and travel behavior. This will assist the City in achieving its short- and long-term greenhouse gas emissions reduction targets.

SMART targets businesses, schools and individuals in San Mateo and encourages them to reduce San Mateo's carbon footprint by changing simple, day-to-day behaviors. Businesses can receive a SMART designation by pledging to meet certain guidelines consistent with carbon reduction. A Web site dedicated to SMART uses a pledge form where businesses, individuals and even children can calculate their emissions and make their pledge to live SMART.

As individuals pledge to reduce their carbon footprints, they will receive a SMART card that can be used at participating businesses where they will receive special discounts and/or promotional items. To further promote campaign efforts, some businesses will sell or provide SMART reusable cloth bags that will feature the participating business and SMART logos.

<http://www.cityofsanmateo.org/index.asp?NID=1536>

IX. Implementation

The previous chapters analyze 21 energy use, transportation, and land use reduction measures intended to reduce community emissions in San Carlos by 35% below 2005 levels by 2030. These measures were the result of extensive research, community participation, CAP subcommittee discussion, and City staff input. They represent the hard work and initiative of the City of San Carlos to go above and beyond normal practice by proactively addressing our relationship to global climate change.

This report lays a foundation that will be revised and built upon for years to come. Implementation remains the most difficult component to climate action because the field is always evolving with new technology, policy, and resources. However, having calculated the best known costs and benefits to each reduction measure, we can identify several “low hanging fruits” that bear low initial costs and large reductions in emissions.

It is recommended that one individual within the City would coordinate implementation of these reduction measures and the operation of the programs that result from implementation. Individual department leads may also be warranted to ensure efficient cross-coordination in implementing these measures.

Suggested Prioritization of Reduction Measure Implementation

This chapter separates reduction measures into three time periods for implementation: 2005 to 2010, 2010 to 2015, and 2015 to 2030. Phases indicate when implementation of the measure begins; the reduction effects and overall maintenance of the program will extend well beyond the allotted phase. All reduction measures will begin implementation by 2020. The period of 2020 to 2030 will be for evaluation and expansion of reduction measures.

These implementation lists were generated to help identify which reduction measures are more cost effective, robust, and/or feasible and should therefore be implemented first. All of the reduction strategies are essential to reach the goals set forth in this Climate Action Plan; however some are expected to be implemented on a later timeline due to obstacles of available data, technology, or finances, as described on the following pages.

Phase 1: Reduction Measures to Begin Implementation 2005 to 2010

The majority of Phase 1 reduction measures are those that have already begun to be implemented. The progress of these reduction measures is explained at the end of Chapters 4 through 6.

Table 33
Phase 1: Reduction Measures to Begin Implementation 2005 to 2010

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO ₂ e per year)	First Year Costs per Metric Ton CO ₂ e	Estimated Cost to City
25	Expand energy saving opportunities to businesses	13,300	\$0.18-\$0.38	\$2,500 - \$5,000
27	Improve residential energy efficiency	14,115	\$0.84	\$10,000
50	Encourage development that is mixed-use, infill, and higher density	5,544	\$0.81-\$1.62	\$4,500 - \$9,000
52	Increase housing density near transit	4,957	\$4.54 - \$9.08	*\$22,500 - \$45,000
55	Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools	170	\$923.52	**\$157,000
59	Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking	122	Negligible	***\$24,000 - \$48,000
66	Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles	59	\$6,537-\$7,027	***\$385,740 - \$414,648
77	Increase overall waste diversion by at least 1% per year	6,222	Negligible	Negligible
65	Enforce affordable housing development standards	192	Negligible	Negligible

*This cost would be included as part of the Zoning Ordinance update following adoption of the General Plan.

**This cost has been partially addressed through the recent installation of bicycle sharrows (Approx. \$45,000), implementation of the 2003 Bicycle and Transportation Plan, as well as Federal stimulus funding for crosswalks and curb ramp improvements (\$550,000).

***This cost would be reflected in the Equipment Replacement fund which would cover future costs as vehicles are replaced over time.

Phase 2: Reduction Measures to Begin Implementation 2010 - 2015

These reduction measures are the “low hanging fruit,” or the measures that have the most return for the lowest cost.

Table 34
Phase 2: Reduction Measures to Begin Implementation 2010 - 2015

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO ₂ e per year)	First Year Costs per Metric Ton CO ₂ e	Estimated Cost to City
31	Adopt a green building standard for new development and major remodels.	11,868	\$0.93	\$10,000
36	Create water and waste efficient landscapes.	416*	\$4.81-\$9.62	\$2,000 -\$4,000
37	Identify opportunities for on-site renewable energy generation on City and privately- owned property	394	\$1,282-1,320	**\$10,000
41	Implement reduction strategies included in the energy audit of City facilities and continue to monitor City facility performance	16	N/A	Unknown
42	Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect	2,320	Negligible	Negligible
43	Encourage tree planting	356	\$35.96- \$71.91	\$12,800 -\$25,600
53	Increase bike parking	125	\$6 - \$12	\$900 - \$1,800
74	Support zero waste	83.7	\$59.74	\$5,000
76	Increase recycling and composting at public events	255	Negligible	Negligible

* These emissions are not included in the final reduction target analysis as emissions associated with the filtration and movement of water were not included in the City's baseline Greenhouse Gas Inventory as a disaggregated total.

**This cost would cover a feasibility study of on-site energy generation.

***This cost would partially be covered by the existing Building Division Code Enforcement Program.

Phase 3: Reduction Measures to Begin Implementation 2015 - 2020

The majority of the Phase 3 reduction measures involve changes that depend on future technology, monetary resources, or political feasibility.

Table 35

Phase 3: Reduction Measures to Begin Implementation 2015 - 2020

Page	Reduction Measure	Emissions Reductions (Metric tons CO2e per year)	First Year Costs per Metric Ton CO2e	Estimated Cost to City
62	Provide for a shuttle service in order to increase transit ridership	1,733	\$1.15 - \$2.30	\$2,000 - \$4,000
63	Promote car sharing programs	1,158	\$1.55 - \$3.11	\$1,800 - \$3,600
67	Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles	49	\$200	\$10,000

Implementation Funding

One of the main barriers to seeing through an implementation plan is lack of available funds. There are multiple grant and loan programs through State, Federal, and regional sources to combat climate change. The production of this Climate Action Plan is the result of the Climate Protection Grant program through the Bay Area Air Quality Management District (BAAQMD). With the establishment of this plan for action, San Carlos is in a position to apply for additional funding to implement the supporting measures in a timely fashion. Funding sources may include the Association of Bay Area Governments, the Energy Efficiency and Conservation Block Grant (EECBG) program, the Sustainable Skylines Initiative, and the Bay Area Air Quality Management District.

In addition, funding opportunities will increase with implementation of state legislation approved in 2008. In the energy sector, SB 1754 provides for State financial assistance for installing renewable energy projects. AB 2466, on the other hand, mandates that local governments be paid for the excess renewable energy they generate. With the funding from current State bills and future grant programs like those above, San Carlos is likely to receive assistance in seeing through its climate action goals and measures.

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Appendix A: Initial Cost Analysis Calculations

Appendix A: Initial Cost Analysis Calculations

This appendix details the methodology, sources, and calculations for the initial cost estimates included in the Climate Action Plan. Only initial costs of the supporting measures are calculated in order to create an even basis of comparison. While some measures include simple payback or rate of return data, these statistics are for information purposes only.

Initial cost analyses for the 21 reduction goals are based on the experience of City Staff and research conducted by PMC and ICLEI. City Staff from planning, public works, and building inspection gave estimates of time and materials to the City for implementing each measure. The initial costs of other measures were based on market research and the experience of similar cities.

The initial cost estimate for many reduction measures are represented as a range. This is due to the different hourly pay rates of staff, which are anywhere from \$50 - \$100 per hour once salary, insurance, and other costs to the City are taken into account.

Energy Use

1. Expand energy saving opportunities to businesses

1.1 Consider developing a tax rebate program for efficiency improvements in businesses.

Data Source	N/A
Interpretation	The initial cost of a tax rebate program cannot be determined until a more specific scope is determined. Any rebate program would need to be balanced against other revenue generating sources.
Total	Unknown

1.2. Expand energy saving opportunities for large and small commercial and industrial properties.

Data Source	City Staff and PMC
Interpretation	The cost of this program would be borne by existing programs through PG&E and the State. The only cost to the city would be facilitation, which is estimated to be 50 hours of staff time per year. $50 \text{ hrs} * (\$50 - \$100 / \text{hr}) = \$2,500 - \$5,000$ per year. There is a possibility for community group assistance or funding this effort through grant opportunities.
Total	\$2,500 - \$5,000 per year

2. Improve residential energy efficiency

2.1. Establish energy efficiency standards for new construction and remodel projects that exceed the State's 2008 Title 24 energy standards by 15%.

Data Source	City Staff and PMC
Interpretation	It is estimated that writing energy efficiency standards for new construction and remodel projects would take approximately 100 hours of Staff time, which equates to \$10,000. There would be additional costs associated with staff time needed for plan checks, however this cost will be absorbed through cost recovery

	agreements with the applicants.
Total	\$10,000
2.2. Perform energy-efficient lighting retrofits and/or home energy audits.	
Data Source	Acterra and PMC
Interpretation	The cost of this measure depends on whether the home energy audits are coordinated by a non-profit organization or by community groups. A non-profit organization, such as Acterra, estimates that a proposal for San Carlos would be similar to that for Menlo Park, which was \$35,000 for 250 home energy audits in one year. Alternatively, costs to the City for a home energy audit program run by community groups would be negligible. With these assumptions, this reduction measure will have costs anywhere from \$0 - \$35,000.
Total	\$0 - \$35,000
2.3. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	
Data Source	PMC and Pacific Gas and Electric (www.pge.com)
Interpretation	The cost of distributing free or subsidized energy and water saving devices and services is minimal assuming that supplies are provided as they have been historically by utility providers and through promotions. Some staff time would be anticipated as a liaison with PG&E and other service providers; however these positions already exist and would not be an additional cost to the City.
Total	Negligible
2.4. Expand and better integrate programs that increase energy efficiency in low-income households.	
Data Source	PMC and Federal Low-Income Household Energy Assistance Program (http://www.acf.hhs.gov/programs/ocs/liheap/)
Interpretation	The Federal Low-Income Household Energy Assistance Program (LI-HEAP) distributes funding for low-income weatherization services as does the U.S. Department of Energy and PG&E. It is likely that some coordination time from City staff would be necessary to determine applicant eligibility; however this effort would likely be covered by grants or other revenue sources.
Total	Negligible

3. Adopt a green building standard for new development and major remodels

3.1A. Provide information and support to developers on LEED and GreenPoint standards.

Data Source	City Staff and PMC
Interpretation	Supporting State green building requirements would not impact the City's existing building services. The cost of promoting LEED and GreenPoint standards through informational handouts and conversations with applicants about the benefits of green building would be equivalent to the current level of outreach.
Total	No additional cost

3.1B. Create a green building ordinance requiring a GreenPoint, LEED, or equivalent green building certification per development category.

Data Source	City Staff and PMC
Calculation	Depending on the type of green building ordinance adopted (regional or custom), the cost of development of the code could

vary substantially.

For a regional approach, the City Council's preferred option, the primary costs would be related to development of the green building ordinance since there would be no public workshops or local coordination at the City level. According to City staff, if the ordinance is coordinated with neighboring jurisdictions or coordinated regionally, the cost of the ordinance would be minimal, with only staff time to coordinate the process. Training on LEED and GreenPoint certification would require a day-long training session with costs from \$10,000 in staff time and materials.

For a custom approach, the up front cost of developing a green building ordinance just for the City of San Carlos could be much higher. According to staff cost estimates and informal queries of neighboring jurisdictions, costs could range from less than \$10,000 to over \$100,000. Most formal cost estimates do not account for staff time associated with project development and are not consistent with our conservative approach to estimating fully loaded cost. For this reason, comparable studies were not available to inform this cost/benefit analysis. Staff estimated the amount of time it would take for City staff to develop a green building code in coordination with consultants and other regional resources.

With San Carlos' history of public involvement, the City would host public workshops to ensure the stakeholders in the community can be involved in what is included in a custom green building code for the City. With the cost of the workshops, writing a custom ordinance, and managing the ordinance development process, the fully loaded costs for the City of San Carlos are estimated to be in the range of \$50,000 to \$75,000. Fully loaded costs include staff time, consultant time, workshop facilitators, materials for distribution and training for building department employees. If this option is selected, staff will apply for grant funding to cover the costs but there is no guarantee that these funds would be granted.

For either approach above, an estimated \$100-\$200 in staff time per plan check would also be necessary with the implementation of LEED, GreenPoint, or equivalent building standard, however this cost would be absorbed by the developer through application fees.

Total \$10,000

4. Create water and waste efficient landscapes

4.1. Formalize the City's water efficient landscaping practice by writing it into the Parks Master Plan.

Data Source	City Staff and PMC
Interpretation	Implementing this goal would alter design standards in the Parks Master Plan, which is estimated to cost a one-time \$10,000 consultant fee. Further analysis would be necessary to determine the hard cost per plant as well as staff time per planting or total cost to hire additional contract landscapers. Adding this measure, and

	formalizing the City's existing policy would not increase costs for physical installation beyond what is already programmed.
Total	\$10,000

4.2. Expand the current landscaping ordinance to require efficient landscaping in conjunction with residential and commercial property improvements.

Data Source	City Staff and PMC
Interpretation	To update and enforce a more restrictive landscaping ordinance, approximately 40 hours of staff time or \$2,000-\$4,000 would be required. Additional review by plan-checkers is estimated to be an added half hour per application or \$3,750-\$7,500 assuming 150 qualifying plan checks per year, however this cost would be absorbed by the applicant.
Total	\$2,000-\$4,000

5. Identify opportunities for on-site renewable energy generation on City and privately-owned property

****Overall: \$10,000 Cost to the City for a feasibility study of on-site energy generation.**

Source: City Staff and PMC.

5.1. Identify opportunities for increasing solar system installations in the community and on City facilities.

Data Source	PMC – also see footnotes
Interpretation	The average cost of PV installation per kW is \$9,000 without subsidies or financial assistance. ¹ Keeping with our assumptions above, the gross cost to the City for installing an additional 100 kW of solar panels would be \$900,000. Much of this cost would be paid back by the California Solar Initiative, which pays \$0.50 per kWh for solar power generation in the first five years. With an average of 4.5 hours of sunlight each day over the course of a year, ² we can estimate that a 100 kW system would produce 164,250 kWh per year. ³ This equates to \$410,625 over five years, or roughly half of the cost of installation. The remaining \$480,000 can be paid incrementally through available loan programs. For the purpose of this analysis we are assuming the initial cost will be paid up front, however longer term return on investment will substantially reduce the cost of purchase and installation.
Total	\$480,000

5.2. Identify opportunities for Wind energy generation.

Data Source	PMC and AWEA
Interpretation	Small wind energy systems cost from \$3,000 - \$5,000 for every kilowatt of generating capacity, or approximately \$40,000 for a 10 kW installed system without taking into account rebates or incentives. ⁴ For the purpose of analyzing the cost benefit of this measure, it is assumed that the City would install ten small-scale wind turbines, which would equal \$30,000 - \$50,000 without

¹ Solar Buzz, "Fast solar energy facts," <http://www.solarbuzz.com/FastFactsIndustry.htm>, accessed November 1, 2008. Middle of \$8-10 per watt price range

² Rocky Grove Sun Company, "How many PV modules?" <http://www.rockygrove.com/design/howmany.html>, accessed November 3, 2008.

³ 100 kW of PV installed * 4.5 sun hours per day * 365 days = 164,250 kW-hours (kWh)

⁴ American Wind Energy Association (AWEA), "Finding Incentives," <http://www.awea.org/smallwind/toolbox2/financing.html>, accessed November 3, 2008.

assistance. The California Energy Commission Emerging Renewables Program provides rebates for wind turbines less than 50 kW. The American Wind Energy Association estimates that this program, along with other federal programs, will cover the cost of a wind turbine within 10 years, resulting in 20 years of relatively no-cost energy.⁵

For the purposes of this study, it is assumed that half of the cost of the wind turbines will be born up-front in order to create consistency with other measures that also have a payback. Therefore, the initial cost of ten wind turbines is estimated to be \$15,000 - \$30,000 assuming most planning and coordination by Staff is completed as part of the initial feasibility study.

Total \$15,000 - \$30,000

5.3. Identify opportunities for Biomass energy opportunities.

Data Source PMC

Interpretation It is difficult to make an estimate of initial cost and greenhouse gas emissions reductions from biomass energy due to the different fuels that could be used. The method of biomass energy production that is commonly quantified at this point is methane capture. However, since the landfills serving the City of San Carlos are outside of the City limits, it would require a coordinated effort with multiple partners and service providers to integrate methane unto the fuel stream for the City of San Carlos.

Total Unknown

6. Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.

Data Source City Staff and PMC

Interpretation Until the inventory is completed, the cost of modifying City facilities and their operations to increase efficiency is unknown. Additionally, the greenhouse gas benefits cannot be calculated until after the inventory is completed.

Total Unknown

7. Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to increase reflectivity and minimize the urban heat island effect

Data Source City Staff, PMC, US EPA (<http://www.epa.gov/heatisland/mitigation>)

Interpretation The US Environmental Protection Agency identifies multiple cool pavement technologies, many of which are similar if not lower in cost to traditional asphalt. There would be some staff time for coordinating with public works and including the high albedo content requirements in the CIP, however these costs would be a component of the next CIP update associated with the General Plan. CalTrans would also need to be contacted regarding El Camino Real and the State's efforts to increase albedo on State highways. Coordinating increased albedo discussions should be coordinated with other CIP and coordination efforts to save time.

⁵ AWEA, "Finding Incentives"

Total	Negligible
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8. Encourage tree planting.

8.1. Provide for City assistance to community tree planting programs and efforts.

Data Source	Case studies, PMC and CAPPA
Interpretation	The 200 trees planted estimate is based on a two year program of 100 trees per year completed before 2015 in order to allow them to mature to a measurable carbon sequestration rate. Cost would be one hour of staff time per tree (\$50-\$100). In addition, twenty hours of staff time would be required for kickoff of the program and the preparation of a Council resolution (\$1,000-\$2,000 depending on staff wage). Assuming that 200 trees are planted by community tree planting programs, we can estimate costs to be \$11,000 - \$22,000 total. If this program is operated by a non-profit or other community organization, the cost of the program would be substantially less. For the purposes of this costs estimate we have included a range of costs for options of implementation.
Total	\$1,000 - \$22,000 total

8.2. Require a specific tree coverage and tree replacement requirement for new development.

Combined with measure 8.3, "Develop and Implement Shading Requirement for City owned parking lots."

8.3. Develop and implement a shading requirement for City-owned parking lots.

Data Source	City Staff
Interpretation	Staff estimates that updating the zoning code with shading requirements (including the shading requirement in the next measure) will cost 36 hours of Staff time, which is equivalent to \$1,800 - \$3,600, however this effort would be combined with other code updates following approval of the General Plan, so the costs would be substantially less than this figure as economies of scale would allow reduced costs for actions on GP update related revisions to the municipal code.
Total	\$1,800 - \$3,600

Transportation and Land Use

1. Encourage development that is mixed-use, infill, and higher density.

1.1. Revise municipal codes to encourage and allow for mixed-use, infill, and higher-density development.

Data Source	City Staff and PMC
Interpretation	It is estimated that it would take approximately 90 hours staff time (\$50-\$100 pay range) = \$4,500 - \$9,000 to complete code revisions in this regard, however this effort would likely be combined with other code updates following approval of the General Plan, so the costs would be substantially less than this figure as economies of scale would allow reduced costs for actions on GP update related revisions to the municipal code.
Total	\$4,500 - \$9,000

2. Increase housing density near transit.

2.1. Revise municipal codes to encourage and allow for higher-density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of the personal automobile.

Data Source	City Staff and PMC
Interpretation	City staff has indicated an estimate of roughly \$22,500-\$45,000 in initial staff time for a planner to write TOD code revisions (equivalent to 450 hours dedicated) however this effort would likely be combined with other code updates following approval of the General Plan, so the costs would be substantially less than this figure as economies of scale would allow reduced costs for actions on GP update related revisions to the municipal code.
Total	\$22,500-\$45,000

3. Increase bike parking.

3.1. Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience.

3.2. Require large employers to provide facilities that encourage bicycle commuting, including shower facilities, and covered or indoor bicycle parking.

Data Source	City Staff and PMC
Interpretation	City Staff estimates approximately 18 hours of effort for planning staff to write bike parking code revisions. When assuming an hourly rate of \$50-\$100 per hour, this translates to \$900-\$1,800 in initial staff time. This effort would likely be combined with other code updates following approval of the General Plan, so the costs would be substantially less than this figure as economies of scale would allow reduced costs for actions on GP update related revisions to the municipal code.
Total	\$900-\$1,800

4. Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.

4.1. Promote traffic calming methods on City streets such as landscaped median barriers and traffic circles.

Data Source	City Staff and PMC
Interpretation	As previously described, traffic calming measures are the responsibility of the neighborhoods, however information could be provided on water bills or through other means for greater outreach and public awareness of the opportunity. Any costs associated with this measure would likely be combined with out outreach programs that are developed as a result of the adoption of this plan.
Total	Negligible

4.2. Establish clear and convenient pedestrian rights of way with shade and minimal tripping hazards.

Data Source	City Staff and PMC
Interpretation	The City already allocates \$50,000 a year to responding to complaints about pedestrian safety. City staff does not estimate

	that additional funds will be necessary to implement this reduction measure.
Total	Negligible
4.3. Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently under review.	
Data Source	City Staff, PMC and <i>Streets and Sidewalks, People and Cars: The Citizens' Guide to Traffic Calming</i> by Dan Burden
Interpretation	Preparation of the Bicycle Transportation Plan has already been accounted for in the current budget. The installation of striping for bike intersections would cost approximately \$100 per striped lane, or for a typical intersection with 4 lanes, \$400. Assuming three additional miles of bike lanes are installed and ten bike intersections are striped, we can estimate that this measure will cost approximately \$157,000. Many of these updates will occur as other improvements are needed, with gradual implementation of this policy through regular maintenance cycles. This being the case, it is likely this program will cost less than estimated, however in keeping with other cost estimates, cost recovery options are not considered.
Total	\$157,000
4.4. Promote “Walk pools” or “Walking buses” to increase the number of students that walk to school.	
Data Source	City Staff and PMC
Interpretation	The cost of advertising and coordinating the routes for the program would be absorbed by parent groups and schools. The cost to the City for coordinating with these programs would be minimal and largely absorbed by the other measures under this goal and existing programs.
Total	Negligible

5. Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, and walking.

5.1. Create a plan to identify and address barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see if the plan's implementation.

Data Source	City Staff and PMC
Interpretation	The initial cost of this measure would be negligible since the plan is in the process of being updated. Some of the expected recommendations of the Bicycle Pedestrian Plan are largely encompassed in the initial cost estimations of other reduction measures in this Plan, yet the specific costs cannot be calculated until the Bicycle Pedestrian Plan is completed.
Total	Negligible

5.2. Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location.

Data Source	City Staff and PMC
Interpretation	The only cost associated with this measure is plan review to ensure that new large-scale development applications address transit, biking, and walking access. It is estimated that this requirement will cost an additional four hours per plan check, or \$200-\$400 dollars, however this cost would be absorbed by the applicant. As

development leaned towards addressing these issues proactively, the time required to complete plan checks would be reduced. Additional costs for review would be borne by the applicant.

Total Negligible

5.3. Provide for an education program to residents and businesses as well as increased code enforcement in order to minimize vegetation that degrades access along public rights of way.

Data Source	City Staff and PMC
Interpretation	A cost of \$9,000-\$18,000 from recurring staff time for Right of Way (ROW) management for approximately 10% of a full-time position for the year at an hourly rate range of \$50-\$100 an hour. An expected extra 300 hours of enforcement annually would take place at \$15,000-\$30,000 in staff costs ongoing per year. These costs could be substantially reduced if community organizations were involved in the program via ongoing education and enforcement.
Total	\$24,000 - \$48,000

6. Provide for a shuttle service in order to increase transit ridership.

6.1. Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain.

Data Source	City Staff and PMC
Interpretation	Estimated \$2,000-\$4,000 in costs generated by 40 hours of staff admin/contract start up time. Operating costs would be covered by Measure A and local businesses. Additional funding is anticipated through Proposition 84 funds that are anticipated in support of SB375 implementation.
Total:	\$2,000-\$4,000

7. Promote car sharing programs.

7.1. See to the establishment of a car sharing program

Data Source	City Staff and PMC
Interpretation	Initial setup and coordination between City staff and the Car Share organization will take approximately 36 hours, or \$1,800 to \$3,600 of staff time. Ongoing management costs are expected to be borne by the car-share program group.
Total	\$1,800 to \$3,600

7.2. Provide for car share parking spaces in convenient locations

Data Source	City Staff and PMC
Interpretation	The costs for signage and re-striping would be borne by the car sharing company. Costs to the City would be minimal and largely encompassed under the existing permitting process. Any updates to parking areas would occur in a regular maintenance cycle and would not be additional to other maintenance.
Total	Negligible.

8. Enforce affordable housing requirements

8.1. Continue to enforce the City's Below Market Rate (BMR) Ordinance (as amended) to support the development of affordable housing in the area

Data Source	City Staff
Interpretation	The Below Market Rate (BMR) Ordinance is already being

	implemented. No additional costs.
Total	Negligible

9. Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.

9.1. Replace 15 traditional automobiles in the City's fleet with more efficient vehicles by 2020.

Data Source	ICLEI CAPPA software
Interpretation	The initial cost for purchasing a Toyota Prius (as one example) for City use has a price range of \$21,430 for base model. This assumes fleet price is \$500 above invoice and includes destination charge with no additional options. Assuming that the City purchases 15 additional hybrid vehicles using this estimated cost as a guide, the total charge to the City would be \$321,450. The replacement of three fleet vehicles (included in this cost) has already occurred. Fleet replacement will be accommodated through normal fleet replacement timelines and would not be additional to other fleet replacement costs. Estimated costs outlined below would be in lieu of other fleet replacement costs currently budgeted.
Total	\$321,450 - \$345,540

10. Increase accommodation and promotion of alternatively fueled vehicles and hybrids.

10.1. Offer prioritized parking for hybrid or alternative fuel cars on City streets.

Data Source	City Staff and PMC
Interpretation	This measure will consist of initial restriping for the selected priority parking spaces, which also is considered an ongoing public works task with a cost of \$100 per parking space. Another \$400 per parking space relating to enforcement of the designated priority spaces by proper cars is estimated. Therefore, assuming that 20 spaces are converted, we can estimate that the cost of this measure is approximately \$10,000.
Total	\$10,000.

10.2. Encourage alternative fueling stations within close proximity to potential customers.

Data Source	City Staff and PMC
Interpretation	The process of encouraging alternative fueling stations within San Carlos would largely be incorporated the zoning code update effort following adoption of the General Plan update in 2009.
Total	Negligible

10.3. Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations.

Data Source	City Staff and PMC
Interpretation	The cost to the City for encouraging electric vehicle recharging stations is negligible. Parking and recharging stations would be incorporated into existing incentives and concessions for project approval. As a point of information, the cost to the developer is estimated to be five thousand dollars per lot for recharging stations, including equipment & installation initial cost. The costs to the City would be minimal and incorporating design requirements of proposed facilities would be incorporated into the zoning code

	update effort following adoption of the General Plan update in 2009.
Total	Negligible.

Solid Waste

1. Support Zero Waste.

1.1. For municipal operations, establish a zero waste policy.

Data Source	City Staff
Interpretation	A zero waste policy would require approximately 200 hours of Staff time per year for training, purchasing of receptacles, and coordinating with handlers, or approximately \$10,000 to \$20,000 depending on pay grade. City staff members are already spending this amount of time on coordination of recycling efforts, but this time would be shifted to the new zero waste policy and accompanying trainings.
Total	Negligible

1.2. Establish an environmentally preferable purchasing program (EPP) for government operations

Data Source	City Staff and PMC
Interpretation	City staff estimates that the initial cost for preparing an Environmentally Preferable Purchasing ordinance would be approximately \$5,000. There may be additional costs at the onset for quality control of new and unfamiliar products and their providers. There is also potential for higher material costs, although research is showing that the costs of environmentally preferable products are comparable with traditional products. There are also significant cost-saving opportunities in the future for EPPs. Entering into a regional purchasing cooperative may reduce costs by allowing neighboring cities to buy sustainable products in bulk. Organizations like the State Regional Purchasing Cooperatives and Joint Venture Silicon Valley may be able to facilitate or aid in a program such as this.
Total	\$5,000

2. Increase recycling and composting at public events.

2.1. Require recycling and composting as a condition of approval for public events.

Data Source	City Staff and PMC
Interpretation	An additional two hours of staff time (\$100-\$200) per public event contract would be necessary under this reduction measure. This includes informing and monitoring recycling and composting opportunities at the applicants' events. The costs of recycling and composting would be incurred by the event holder, not the City. According to City records, approximately 25 public events occur annually in the City of San Carlos. Therefore, an estimated \$2,500 - \$5,000 is foreseeable to implement this measure. A similar practice is already in place so the training would be minimal. Long term costs associated with this reduction measure are considered negligible as resources and awareness will improve over time.
Total	Negligible

3. Increase overall waste diversion by at least 1% per year.

3.1. Increase required Construction and Demolition (C&D) diversion rate beyond the 60% currently required.

Data Source	City Staff, PMC and NorCal Waste Contract
Interpretation	The City of San Carlos is already well on its way to preparing for increased waste diversion. A consultant has been hired to address the C&D waste diversion ordinance and prepare a more stringent program. This extra effort for C&D recycling is currently funded through solid waste fees, but it may be funded in the future through C&D permit fee add-ons. The first year of counter work associated with the new C&D requirements is expected to cost approximately \$70,000, however this cost would be born by the applicants.
Total	Negligible

3.2. Provide for expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.

Data Source	NorCal Waste Contract
Interpretation	Expanded outreach to the residents of San Carlos is underway concerning recycling and composting services. In October 2008, City Council directed Staff to begin negotiations with NorCal Waste Systems of San Mateo County to become the new Solid Waste, Recycling and Organics Collection firm in San Carlos starting on January 1, 2011. As part the agreement, NorCal Waste will be providing a six month recycle publicity program to advertise their new programs. They will also do ongoing outreach and public education as part of their contract with the City. As a result, the initial cost to the City is expected to be negligible.
Total	Negligible

3.3. Mandate commercial recycling

Data Source	City Staff, PMC, and NorCal Waste Contract
Interpretation	Costs to mandate commercial recycling would be minimal. The 2011 service contract with NorCal Waste will allow for increased commercial recycling.
Total	Negligible

Appendix B: Greenhouse Gas Emissions Reductions Analysis Calculations

Appendix B: Greenhouse Gas Emissions Reductions Analysis Calculations

This appendix outlines the assumptions, sources, and calculations behind estimates of greenhouse gas emission reductions. Most estimates were facilitated through the Climate and Air Pollution Planning Assistant (CAPPA) tool developed by ICLEI. The tool, currently in Beta, was created to assist local governments in developing customized plans for reducing climate change. CAPPA provides information and quantification tools for over 100 emission reduction strategies in its current form. City-specific data is entered into the CAPPA software and combined with emission coefficients, current research, and the results of pilot programs or case studies in other jurisdictions.

All CAPPA sources were evaluated for reliability and applicability before the calculation was made. Where a CAPPA reduction analysis wasn't available or appropriate, other research and City data was compiled to create an estimate or to display that an estimate is not currently possible. All conversion and assumption sources, whether embedded in CAPPA or original work, are cited below.

The calculations, estimates, and assumptions go as far as the input data (kWh, therms, vehicle miles, tons of waste, etc). The conversion to CO₂e was completed in the CACP software or CAPPA software using verified emissions coefficients.

* = Information Item only. Emission reductions not included in final reduction estimate.

1. Expand energy saving opportunities to businesses

1.1. Consider developing a tax rebate program for efficiency improvements in businesses.

GHG Reduction: *No calculation possible*

1.2. Expand energy saving opportunities for large and small commercial and industrial properties.

2,100 businesses in San Carlos in 2009 (Communication between PMC and the San Carlos Chamber of Commerce Secretary, November 2008). Assume 2,000 businesses in 2005.

Assume existing businesses will achieve an average reduction of 10% by 2020, which is equivalent to 11,500 kWh and 367 therms annually. Reduction estimates per business based on the following reduction estimates and sources built into CAPPA:

KWh Reduction per business = 11,500

Boulder carbon tax of \$0.0004/kWh costs \$46/business annually, indicating average use of 115,000 kWh. 10% savings assumed per ICLEI recommendation.

Source:

http://www.bouldercolorado.gov/files/Environmental%20Affairs/climate%20and%20energy/cap_tax_faq_26mar07_final.pdf

Therm Reduction per business = 367

Based on 8,160 ft², 0.45 therms/ft², 10% savings.

Therms/ft² source: 2003 Commercial Building Energy Consumption Survey

http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set10/2003excel/c14.xls. 8160 ft² calculated from 115,000 kWh, 14.1 kWh/ft².

Boulder carbon tax of \$.0004/kWh costs \$46/business annually, indicating average use of 115,000 kWh. Source:

http://www.bouldercolorado.gov/files/Environmental%20Affairs/climate%20and%20energy/cap_tax_faq_26mar07_final.pdf

kWh/ft² Source:

http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set11/2003excel/c24.xls

GHG Reduction: 13,300 Metric Tons per year

2. Improve residential energy efficiency

2.1. Establish energy efficiency standards for new construction and remodel projects that exceed the State's 2008 Title 24 energy standards by 15%

2008 Title 24 Energy Efficiency Improvements in comparison to 2005 baseline Title efficiency standards (Source: California Energy Commission, *Impact Analysis: 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings*, November 2007):

Sector (Energy Type)	Reduction from 2008 Standards	Tier 1 Reduction (+15%)	Tier 2 Reduction (+30%)	2020 Tier 1 Reductions	2030 Tier 2 Reductions
Residential New Construction (electricity)	21.80%	36.80%	51.80%	334.68864	*972.51
Residential New Construction (natural gas)	9.82%	24.82%	39.82%	458.306264	*1974.49
Nonresidential New Construction (electricity)	4.90%	19.90%	34.90%	2150.2348	5083.86904
Nonresidential New Construction (natural gas)	9.40%	24.40%	39.40%	1240.6912	2700.88576
Total	--	--	--	4183.920904	10731.7548

* Represents entire growth in residential electricity in natural gas after 2020. The recent California Long-Term Energy Efficiency Plan recommended that Title 24 standards be updated to require new residential buildings will be zero net energy by 2020. Assuming that this is implemented, Title 24 would result in at least a 2,947 metric tons of CO₂e reduction.

This is based on the following change in emissions between 2005, 2020, and 2030. Based on current trends, it is estimated that 2/3 of pre-2020 growth will occur between the effective date of these standards and 2020.

Business-As-Usual Emissions growth	Change from 2005 - 2020	Change from 2020- 2030
Residential electricity	1364.22	972.51
Residential natural gas	2769.78	1974.49
Nonresidential electricity	16207.8	14566.96
Nonresidential natural gas	7627.2	6855.04
Total	27969	24369

GHG Reduction: 4,184 metric tons per year by 2020
10,732 metric tons per year by 2030

2.2. Perform energy-efficient lighting retrofits and/or home energy audits.

Difference between an efficient and non-efficient home in San Carlos from the Home Energy Saver calculator developed by the Lawrence Berkeley National Laboratory - <http://hes.lbl.gov/> (Session ID# 1260074). Calculator estimates difference of 2,400 kilowatt-hours (kWh) of electricity and 445 therms of natural gas per year. Assuming that an energy auditing program serves at least 500 existing homes before 2030 (250 before 2020 and 250 before 2020), we can estimate that energy consumption in San Carlos would decrease by 600,000 kWh and 111,250 therms per year by 2020 and 1,200,000 kWh and 222,500 therms per year by 2030.

GHG Reduction: *1,452 metric tons per year*

2.3. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.

Assumption that at least 10,000 CFLs, 500 showerheads, and 500 faucets will be distributed and used before 2020. Assumptions based on a previous device distribution project by San Carlos Green. kWh savings of various devices obtained from the U.S. Department of Energy – Energy Efficiency and Renewable Energy (http://www.eere.energy.gov/buildings/info/documents/pdfs/lmc_vol1_final.pdf)

This reduction measure would reduce energy consumption associated with lighting and with water filtration, movement, and heating. Specifically, this reduction measure would reduce greenhouse gas emissions from the following sources in the following ways:

- Compact Fluorescent Lightbulbs (CFLs): Each CFL saves an average of 44 kWh per year when replacing traditional incandescent bulbs.¹ We estimate that 10,000 incandescent lightbulbs will be replaced with CFLs by 2020 and 10,000 more incandescent lightbulbs will be replaced with CFLs by 2030. Assuming that CFLs continue to be used after initial replacement, we can estimate that energy consumption will reduce by 440,000 kWh per year. This is equivalent to 93 metric tons of CO₂e per year.
- Low-flow showerheads: Low-flow showerheads save energy associated with water filtration, movement, and heating. Assuming that 1,000 low-flow showerheads are distributed and used, this reduction measure could save 66 metric tons of CO₂e per year from the filtration, movement, and treatment of water. However, since energy for these purposes is not included in the baseline 2005 inventory, this reduction is provided as an information item only. Low-flow showerheads also save energy because they require less water to be heated. Assuming that 42 percent of San Carlos residents use electric water heaters and the rest use gas, this reduction measure would result in an additional reduction of 66 metric tons CO₂e per year. Since energy for heating water within homes is included in the 2005 baseline, this figure will be included in the analysis of San Carlos' total reductions.
- Low-flow faucets: Low-flow faucets, much like showerheads, save energy associated with water filtration, movement, and heating. As an information item, 1,000 low-flow faucets would save 6 metric tons of CO₂e per year from water filtration, movement, and treatment. In addition, this measure would save 12 metric tons of CO₂e from less water

¹ ICLEI CAPPA software estimates 44 kWh a year in savings based on replacing half 100watt and half 60w incandescent bulbs with 25w and 15w cfls respectively (i.e. avg 80w replaced with avg 20w, for 60w per bulb savings). Assumes each bulb is on 2 hours per day, which is average for residential lights according to National Lighting Inventory and Energy Consumption Estimate 2002. http://www.eere.energy.gov/buildings/info/documents/pdfs/lmc_vol1_final.pdf.
60w x 2hours/day x 365 days/year = 44 kWh/year

having to be heated. As described above, only the emissions reductions associated with in-home heating of the water will be included in the total of San Carlos' reductions.

CFLs, low-flow showerheads, and low-flow faucets together save an estimated 243 metric tons of CO₂e per year, 171 metric tons of which will be included in the final analysis of San Carlos' reductions.

GHG Reduction: 171 metric tons per year

2.4. Expand and better integrate programs that increase energy efficiency in low-income households.

Assumption that 1,000 homes will be served by weatherization programs (feasible number based on weatherization programs in neighboring Bay Area cities). Reduction estimates per household based on the following reduction estimates and sources built into CAPPa:

Energy savings per home = 1,300

Source: Report on the impacts and costs of the lowa low-income weatherization program--calendar year 2006. <http://www.waptac.org/si.asp?id=1143>.

Therms savings per home = 222

Source: Report on the impacts and costs of the lowa low-income weatherization program--calendar year 2006. <http://www.waptac.org/si.asp?id=1143>.

GHG Reduction: 1,760 metric tons per year

3. Adopt a green building standard for new development and major remodels

3.1A. Provide information and support to developers on LEED and GreenPoint standards.

It is estimated that promotion of voluntary Code requirements and promotion of LEED/GreenPoint certification would lower energy consumption in new development and remodels by an estimated 2.5% in addition to Energy Use Measure 2.1.

	2005-2020 Increase	2020-2030 Increase
Business-as-Usual Energy Use	27,969	24,369
2.5% Reduction	*466	**535.5

*Assume 2/3 of growth will occur after promotion has begun and Code is enforceable (Jan 2010)

**Reductions from commercial sector only. Residential sector considered zero net energy in 2.1.

GHG Reduction: 466 metric tons annually by 2020
535.5 metric tons

3.1B. Create a green building ordinance requiring a GreenPoint, LEED, or equivalent green building certification per development category.

LEED, GreenPoint, or equivalent standards are estimated to lower energy consumption in new development and remodels by an estimated 30%. This is a low estimate of an estimate given by the US Green Building Council (USGBC) which estimated a 50% reduction.²

GHG Reduction: 11,868 metric tons annually by 2020

² US Green Building Council, CEO of U.S. Green Building Council discusses benefits of green building, <http://www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=2882>, accessed December 2, 2008.

4. Create water and waste efficient landscapes

***4.1. Formalize the City's efficient landscaping practice by writing it into the Parks Master Plan.**

According to the San Carlos Parks Master Plan, there are 143 Acres of park land in San Carlos. For this analysis, we will assume that 50% of park land is landscaped. This estimate is supported by City staff as the exact percentage and/or acreage of landscaped open space is unavailable. Energy savings from water calculated using the CEC's "Redefining Estimates of Water Related Energy Use In California" in 2006.

GHG Reduction: **69 metric tons per year*

***4.2. Expand the current landscaping ordinance to require efficient landscaping in conjunction with residential and commercial property improvements.**

General Plan Buildout estimates show an increase of 1,686 households before 2030. For the analysis, 50% (843) were assumed to be detached family houses requiring efficient landscaping. Since recent California-specific data is unavailable, the national average yard size (.5 acres) was used as well as national averages for lawn mower gasoline consumption, average waster consumption per acre of lawn, and average energy use per gallon of water.

The average acre of lawn in the U.S. uses 652,000 gallons of water each year. Source: <http://dare.agsci.colostate.edu/thilmany/golfresource.pdf>. p.4

In northern California, 10,000 gallons of water takes 54 kWh for indoor use and 35 kWh for outdoor use for transport, treatment, distribution, and wastewater treatment. Source: California Energy Commission. REFINING ESTIMATES OF WATER RELATED ENERGY USE IN CALIFORNIA. 2006. Table ES-1.

Using these figures, it can be estimated that a more efficient landscaping requirement would reduce emissions by 416 metric tons of CO₂e per year solely from new development.

GHG Reduction: **416 metric tons per year*

5. Identify opportunities for on-site renewable energy generation on City and privately-owned property

5.1. Identify opportunities for increasing solar system installations in the community and on City facilities.

Assumption that a minimum of 400 kW would be installed on city property. Hours of sunlight per day in San Carlos obtained from www.rockygrove.com.

Annual kWh Produced = kWh Installation * Hours of sunlight per day * 365
= 400 kWh * 4.5 hours * 365 = 657,000 kWh

GHG Reduction: *263 metric tons per year*

5.2. Identify opportunities for Wind energy generation.

Assumption that ten small-scale wind turbines will be installed before 2020. Each turbine of 10-kW will produce approximately 22,000 kWh per year based on information from the American Wind Energy Association (AWEA). Total of 328,500 kWh of clean energy produced per year in San Carlos.

GHG Reduction: *131 metric tons per year*

5.3. Identify opportunities for Biomass energy opportunities.

GHG Reduction: No Calculation

6. Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.

The total GHG reduction from a City audit and retrofit is unknown until the audit is completed. However, the audit and retrofit recommendations of the Adult Community Center will produce 16 metric tons of GHG emissions.

GHG Reduction: 16 metric tons per year

7. Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to increase reflectivity and minimize the urban heat island effect

The Lawrence Berkeley National Laboratory Urban Heat Island Group estimates that pavement reflectivity can be raised on average only 15% in an urban area. This 15% causes four metric tons of carbon dioxide to be offset per 1,000 square feet replaced when compared to traditional asphalt. Assuming that 12% of San Carlos is covered in pavement, or approximately 2 million square feet, and assuming that 30% of hardscape controlled by the City is repaved with high albedo content material by 2020, we estimate that this measure will result in at least 2,320 metric tons of CO₂ equivalent savings per year.

Source:

Global Cooling: Increasing World-wide Urban Albedos to Offset CO₂," by Hashem Akbari, Surabi Menon, and Arthur Rosenfeld, appeared in *Climatic Change* June 2009

GHG Reduction: 2,320 metric tons per year

8. Encourage tree planting

8.1. Provide for City assistance to community tree planting programs and efforts

Assumption that at least 400 new trees would be planted as a result of this program. Energy savings from increased shading and reduced urban heat island effect calculated by CAPP. CAPP assumptions/sources:

Annual Electricity Savings per Tree = 7 kWh

Energy savings are from reduction of urban heat island effect.

Savings = 0.22F temperature decrease/1% increase in canopy cover x 1% canopy/.75 tree/person x 1.75 % change in peak energy/degree F x 12,600 kWh/person*yr x 0.11 decrease in average energy/decrease in peak energy.

0.22 F/1% canopy is middle of .07-.36 F range from EPA Heat Island Effect.

<http://www.epa.gov/heatisland/strategies/vegetation.html>.

1.75% change in peak energy /F is middle of 1.5-2% range from

<http://www.epa.gov/heatisland/about/energysavings.html>.

1% canopy=.75 tree/person from <http://www.fs.fed.us/ne/syracuse/NatUFAssessments.htm>. 3.8 Billion urban trees provide 27% canopy cover for 75% of US population who live in urban areas in 1990. 1990 population 249million from US Census for urban population of 187 million and 20 trees/person.

20 trees/27% cover = .75tree/1% cover.

12,600kWh/person from CIA World Factbook: 3.7×10^{12} kWh total US electricity consumption in 2004, 3.01×10^8 population in 2007 with 0.9% growth for estimated 2004 population of 293 million.

0.11 decrease in average energy/decrease in peak energy from
<http://eetd.lbl.gov/HeatIsland/EnergyUse/>. Peak energy savings worth \$100,000/hr is worth \$100 million/year, for 1000 hrs/yr of savings out of 8760 hrs. $1000/8760=0.11$

Annual CO2 Sequestered per Tree = 0.25 metric tons

Source: Tree Benefit Estimator <http://www.appanet.org/treeben/calculate.asp>.

GHG Reduction: 102 metric tons per year

8.2. Require a specific tree coverage and tree replacement requirement for new development

Assumption that at least 900 new trees would be planted as a result of this program. Tree benefit from APPA Tree Benefit Estimator using the same sources and estimates as outlined above in 8.1.

GHG Reduction: 228 metric tons per year

8.3. Develop and implement a shading requirement for City-owned parking lots

Assumption that at least 50 trees will be planted as a result of this measure. Tree benefit from APPA Tree Benefit Estimator using the same sources and estimates as outlined above in 8.1.

GHG Reduction: 26 metric tons per year

Transportation and Land Use

1. Encourage development that is mixed-use, infill, and higher density.

1.1. Revise municipal codes to encourage and allow for mixed-use, infill, and higher-density development

Assumption that half of the development in San Carlos from 2005 to 2030 will be mixed-use, infill and higher-density. Development growth based on General Plan projections. VMT reduction of 25% for affected development based on research by the Victorian Transportation Planning Institute (VPTI) www.vtpi.org.

GHG Reduction: 5,544 metric tons per year

2. Increase housing density near transit.

2.1. Revise municipal codes to encourage and allow for higher-density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of personal automobiles

Assumption that half of the development in San Carlos from 2005 to 2030 will be transit-oriented development growth based on General Plan buildout. CO₂e reduction based on a 2003 California TOD travel characteristics study which found TOD office workers within a half mile of rail transit stations have transit commute shares averaging 19% as compared to 5% region wide. For residents, the statewide average transit share for TODs within a half mile of the station was 27% compared to 7% for residences between a half mile and three miles of the station.³

GHG Reduction: 4,957 metric tons per year

3. Increase bike parking.

3.1. Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience

Assumption that bike parking would replace 300 average-length weekly car trips.

Assumption that average bike/car trips are 10 miles.

Source: National Household Travel Survey. 2001. 2,298 Billion miles / 235 Billion trips = 9.8mi/trip.
http://www.bts.gov/publications/highlights_of_the_2001_national_household_travel_survey/html/table_02.html

GHG Reduction: 75 metric tons per year

3.2. Require large employers to provide facilities that encourage bicycle commuting including shower facilities and covered or indoor bicycle parking

Assumption that bike parking would replace 200 average-length weekly car trips based on case studies. Assumption that average bike/car trips are 10 miles as sourced above in 3.1.

GHG Reduction: 50 metric tons per year

³ Victoria Transport Policy Institute. "Transit Oriented Development." Online TDM Encyclopedia, <http://www.vtpi.org/tdm>, accessed Sept. 30, 2008.

4. Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, and walking.

4.1. Promote traffic calming methods on City streets such as landscaped median barriers and traffic circles

4.2. Establish clear and convenient pedestrian rights of way with shade and minimal tripping hazards.

4.3. Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently being updated

4.4. Promote “Walk pools” or “Walking buses” to increase the number of students who walk to school

To quantify the greenhouse gas emissions reduction from this measure, it was combined with components 5.2, 5.3 and 5.4 under this measure in order to create a scenario parallel to similar quantified case studies and research. It is therefore estimated that these four reduction measures will cause a total of 750 additional weekly biking and walking trips originating from within the City of San Carlos. Assumption that average bike/car trips are 10 miles as sourced in 3.1.

GHG Reduction: 170 metric tons per year

5. Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.

5.1. Create a plan to identify and address barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see to the plan's implementation

GHG Reduction: No estimate

5.2. Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location. Require parking lots to be designed in a way that promotes pedestrian, transit, and bicycle travel to and from the site

Estimate that this reduction measure will result in an additional 400 walking and biking trips per week. Assumption that average bike/car trips are 10 miles as sourced in 3.1.

GHG Reduction: 122 metric tons per year

5.3. Provide for an education program to residents and businesses as well as increased code enforcement in order to minimize vegetation that degrades access along public rights of way

GHG Reduction: No estimate

6. Provide for a shuttle service connecting areas not adequately served by public transit to public transit.

6.1. Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain

Assumption that a shuttle program would attract 500 new daily rider to public transit that weren't previously using transit. Based on data from the City's pilot shuttle program, SCOOT. Assumption that average car trips are 10 miles (round trip) as sourced in 3.1.

GHG Reduction: 1,733 metric tons per year

7. Promote car sharing programs.

7.1. See to the establishment of a car sharing program

7.2. Provide parking spaces for car share vehicles at convenient locations accessible by public transportation

It is estimated that a car share program in San Carlos would reduce greenhouse gas emissions by at least 1,158 metric tons of CO₂e per year. This estimate is assuming that a car share program would attract at least 1,000 members and that those members would reduce vehicles miles traveled by at least 30%, figures based a study of carshare programs by Robert Cervero. Source: Victoria Transportation Planning - <http://www.vtapi.org/tdm/tdm7.htm>

GHG Reduction: 1,158 metric tons per year

8. Enforce affordable housing requirements

8.1. Continue to enforce the City's Below Market Rate (BMR) Ordinance (as amended) to support the development of affordable housing in the area

This estimate is based on San Carlos's current BMR ordinance, which requires 15% BMR units for every development over 7 units.

URBEMIS provides a 4% reduction in vehicle trips for each deed-restricted BMR unit.¹⁵ Thus, the total reduction is as follows: Trip reduction = % units that are BMR * 0.04

Source: Nelson/Nygaard Consulting Associates, *Creating Low-Traffic Developments: Adjusting Site-Level Vehicle Trip Generation Using URBEMIS*, 2005.

According to the 2009 Housing Element, 35% of development constructed in 2006-2007 was BMR. Assuming constant growth trends of affordable vs. market rate, 35% * .04 = .013825 reduction.

Assume transportation-related GHG growth in San Carlos is due to increases in jobs and populations, equally. As a result, 27% of emissions growth would be the cause of population and 72% jobs. Applying the 1.38% reduction to the 27% population-related emissions growth gives us a reduction of 95 metric tons per year by 2020 and 192 metric tons per year by 2030.

GHG Reduction: 95 metric tons per year by 2020
192 metric tons per year by 2030

9. Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.

9.1. Replace 18 traditional automobiles in the City's fleet with hybrid, electric, alternative fuel, or smaller vehicles by 2020.

Assumption that the City will replace 18 vehicles with hybrid vehicles.

Hybrid miles per gallon = 46

Source: Combined city/hwy mileage for 2008 Toyota Prius.
<http://www.fueleconomy.gov/feg/findacar.htm>

Miles per gallon of vehicle replaced = 20

Source: 19.7 mpg average for passenger vehicles from American Public Transportation Association: 6348 Btu/vehicle mile. 125,000 Btu/gallon / 6348 Btu/gallon = 19.7 mpg

Average annual miles per vehicle: 12,042

Source: Source: National Household Travel Survey.

http://www.eia.doe.gov/emeu/rtecs/nhts_survey/2001/index.html

2.3 x 10¹² vehicle miles / 191 million vehicles.

GHG Reduction: 59 metric tons annually

10. Increase accommodation and promotion of alternatively fueled vehicles and hybrids.

10.1. Offer prioritized parking for hybrid or alternative fuel cars on City streets

GHG Reduction: No Estimate

10.2. Encourage siting of alternative fueling stations within close proximity to potential customers

Assumption that a biodiesel station in San Carlos would cause at least 1,000 gallons of pure biodiesel to be purchased and consumed per month. This estimate is based on the sales of San Mateo Petroleum and adjusted by population and estimated increases in demand (Personal Communication between PMC and San Mateo Petroleum, October 2008). Biodiesel reduction compared to gasoline from National Biodiesel Board, "Biodiesel emissions factsheet," http://biodiesel.org/pdf_files/fuelsheets/emissions.pdf, accessed November 1, 2008.

GHG Reduction: 19 metric tons per year

10.3. Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations

Assumption that 25 electric vehicle recharging stations would be installed before 2020. Assumes recharging stations would be used for daily commutes and replace vehicles with an average of 20 MPG (19.7 mpg average for passenger vehicles from American Public Transportation Association: 6348 Btu/vehicle mile. 125,000 Btu/gallon / 6348 Btu/gallon = 19.7 mpg).

Assumes 4,704 annual vehicle miles replaced per charging station. Calculated assuming parking spots are used for commuting: 5 days/week, 48 weeks/year, 9.8 miles each way.

Source for trip length: National Household Travel Survey. 2001. 2,298 Billion miles / 235 Billion trips = 9.8mi/trip.

http://www.bts.gov/publications/highlights_of_the_2001_national_household_travel_survey/html/table_02.html

GHG Reduction: 30 metric tons per year

Solid Waste

1. Support Zero Waste

1.1. For municipal operations, establish a zero waste policy

Municipal operations produced 93 metric tons of GHG emissions in 2005 (Source: ICLEI, 2005 Municipal Inventory). Goal of diverting 90% of City-generated solid waste would result in a reduction of 83.7 metric tons assuming waste is diverted equally.

GHG Reduction: 83.7 metric tons per year

2. Increase recycling and composting at public events

2.1. Require recycling and composting as a condition of approval for public events

2.2. In support of zero waste, establish an environmentally preferable purchasing program (EPP) for government operations

Assumption that requiring recycling and composting at public events would increase overall waste diversion by 2%. Based on studies of San Francisco's ordinance scaled for the number and size of public events in San Carlos.

GHG Reduction: 255 metric tons per year

4. Increase overall waste diversion by at least 1% per year

4.1. Increase required Construction and Demolition (C&D) diversion rate to 60%

4.2. Provide for expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings

4.3. Mandate commercial recycling

These two measures along with planned improvements to waste collection would increase waste diversion by 1% per year. A 1% increase per year as compared to the previous year (compounded) would bring San Carlos' total waste diversion rate to over 70% by 2030. Waste characterization assumed to be constant.

GHG Reduction: 6,222 metric tons per year

**Appendix C: City of San Carlos Baseline Greenhouse Gas
Emissions Inventory Report (2005), Community-Wide
Emissions, Updated October 2008**



CITY OF SAN CARLOS

Baseline Greenhouse Gas Emissions Inventory Report (2005) Community-Wide Emissions



August 6, 2008
Updated October, 2008

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1. Introduction

1.1. Executive Summary

In May 2008, the City of San Carlos City Council adopted a resolution authorizing the Mayor to sign the San Carlos Climate Protection Letter, thereby committing the City to taking action for climate protection¹. Through this resolution, San Carlos recognized that “climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution.” Through energy efficiency in its facilities and vehicle fleet, clean alternative energy sources, sustainable purchasing and waste reduction efforts, land use and transportation planning, preparing for sea level rise, and other activities, the community of San Carlos can achieve multiple benefits, including lower energy bills, improved air quality, economic development, reduced emissions, and a better quality of life throughout the community. With the assistance of ICLEI – Local Governments for Sustainability, the City has begun its efforts to identify and reduce greenhouse gas emissions.

This greenhouse gas emissions inventory represents completion of the first step in San Carlos’ climate protection process. As advised by ICLEI, it is essential to first quantify recent-year emissions to establish: 1) a baseline, against which to measure future progress, and 2) an understanding of where the highest percentages of emissions are coming from, and, therefore, where the greatest opportunities for emissions reductions are.

Presented here are estimates of greenhouse gas emissions resulting from the San Carlos community as a whole. The estimates are the product of data gathered from organizations including Pacific Gas & Electric (PG&E), the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC) and others on a community wide basis for cities in Silicon Valley and the 9 County Bay Area Region. The data was assembled by the City Staff (Assistant City Manager) and PMC with help from ICLEI at two workshops funded by the Bay Area Air Quality Management District (BAAQMD).

A second phase of this project, the development of a greenhouse gas inventory for City Operations, is now underway. That work is being conducted for 24 cities and counties in Silicon Valley under contract with ICLEI, Joint Venture: Silicon Valley and Sustainable Silicon Valley. Half of the cost of that effort is being funded by C/CAG (City/County Association of Governments). By working as a group, San Carlos and 24 agencies are getting their City Operation inventories at a reduced cost.

Due to the availability of Community greenhouse gas information for San Carlos, and the desire to move forward with the City’s Climate Action Plan (CAP) as part of the General Plan Update project, this baseline report focuses on data related to community wide emissions. Government operations data will be released separately when it becomes available. In order to be consistent with other cities in Silicon Valley and the Bay Area, all data is presented for the year 2005. This data will provide a baseline against which the City will be able to compare future performance, enabling the City to demonstrate progress in reducing emissions.

¹ See Appendix D for a copy of the resolution.

1.1.1. Summary of Updates

In preparation for the City's Climate Action Plan, this emissions inventory was updated and re-released in October 2008 in order to assess the City's proposed reduction and adaptation strategies more accurately. Due to budget and time constraints, the original report did not contain an estimate of Caltrain emissions. This report was also updated with new GHG modeling protocol from ICLEI. A comparison of the draft and final GHG emissions outputs and methodology is included in Appendix D.

1.1.2. Community Emissions Inventory Summary

In the year 2005, the community of San Carlos emitted approximately 231,057 metric tons of CO₂e. As shown in Figure 1 and Table 1 below, the Transportation Sector was by far the largest emitter (49.5%), producing approximately 114,483 metric tons of CO₂e in 2005. Emissions from the Residential, Commercial, and Industrial Sectors accounted for a combined (44.9%) of the total, and the remaining (5.5%) was the result of emissions from waste sent to landfill in 2005.

The majority of Transportation Sector emissions were the result of gasoline consumption in private vehicles traveling on local roads and Highways. GHG figures from the Waste Sector are the estimated future emissions that will result from the decomposition of waste that was generated by San Carlos residents and businesses in the base year 2005.

Figure 1 – Community GHG Emissions by Sector

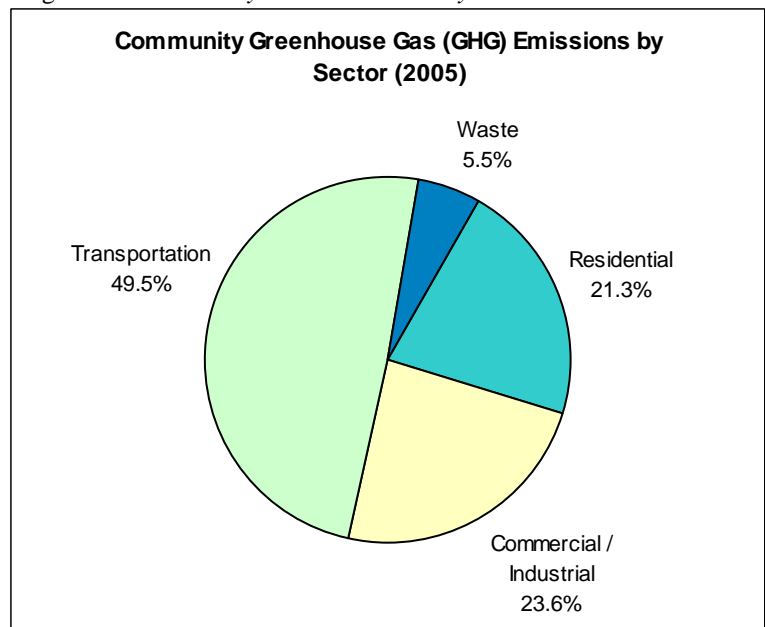


Table 1 – Community Wide Emissions by Sector, 2005

2005 Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO ₂ e (metric tons)	49,178	54,619	114,483	12,777	231,057
Percentage of Total CO ₂ e	21.3%	23.6%	49.5%	5.5%	100.0%
Energy Use (MMBtu)	866,726	856,101	1,566,320	0	3,289,147

Following the Cities for Climate Protection methodology, and what has become standard industry practice, it is recommended that the City of San Carlos begin documenting emission reduction measures that have already been implemented since 2005, and to quantify the emissions benefits of these measures to demonstrate progress made to date. As San Carlos moves forward with considering emission reduction targets for a local climate action plan, the City should identify and quantify the emission reduction benefits of new emissions reduction measures that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, trip reduction, and other strategies.

1.2. Climate Change Background

A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Modern human activity, most notably the burning of fossil fuels for transportation and electricity generation, introduces large amounts of carbon dioxide and other gases into the atmosphere.

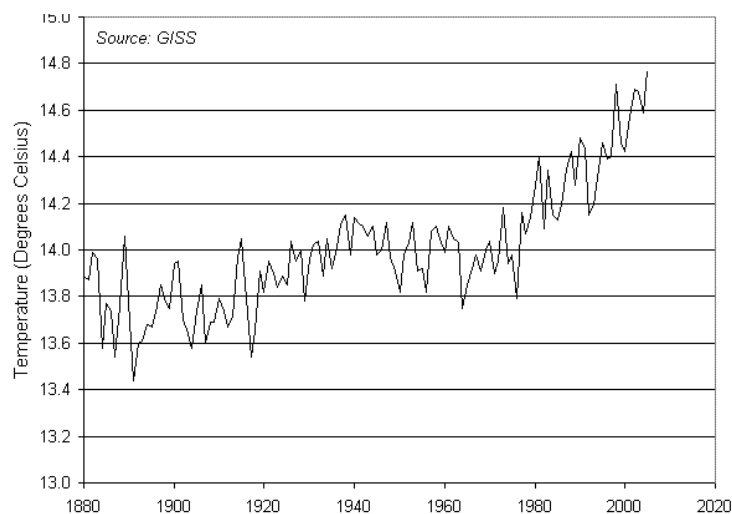
Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperature to rise, which is in turn expected to affect global climate patterns.

Overwhelming evidence suggests that human activities are increasing the concentration of greenhouse gases in the atmosphere, causing a rise in global average surface temperature and consequent climate change. In response to the threat of climate change, communities worldwide are voluntarily reducing greenhouse gas emissions. The Kyoto Protocol, an international effort to coordinate mandated reductions, went into effect in February 2005 with 161 countries participating. The United States is one of three industrialized countries that chose not to sign the Protocol.

In the face of federal inaction, many communities in the United States are taking responsibility for addressing climate change at the local level. In San Carlos, action was taken through a local Climate Protection letter that was developed and adopted by the City Council in May 2008 (Appendix A).

The San Carlos community may be impacted by rising sea levels and resultant changes in the height, salinity and behavior of the San Francisco Bay, as well as other changes to local and regional weather patterns and species migration. Beyond the community, scientists also expect changing temperatures to result in more frequent and damaging storms accompanied by flooding and land slides, summer water shortages as a result of reduced snow pack, and disruption of ecosystems, habitats and agricultural activities.

Figure 2: Average Global Temperature (1880-2005)



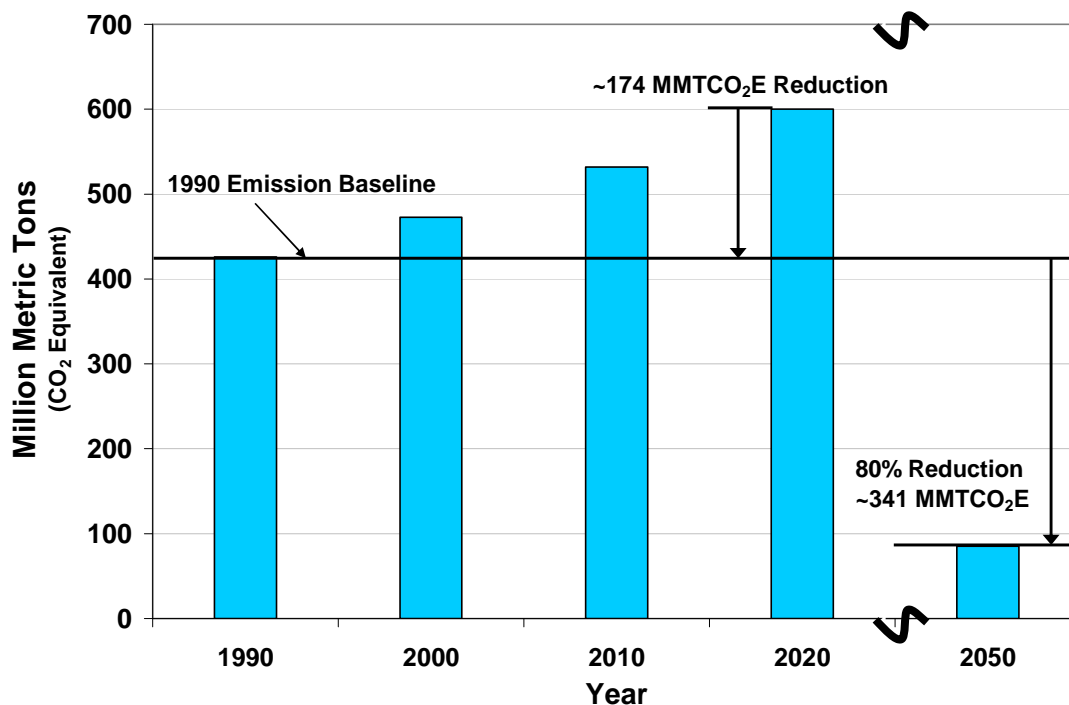
1.3. AB 32 and California Climate Change

On June 1, 2005, Governor Schwarzenegger issued Executive Order S-3-05 (S-3-05). It included the following statewide GHG emission reduction targets:

- by 2010, reduce GHG emissions to 2000 levels;
- by 2020, reduce GHG emissions to 1990 levels;
- by 2050, reduce GHG emissions to 80 percent below 1990 levels.

In 2006, the California State Legislature adopted the California Global Warming Solutions Act of 2006. AB 32 establishes a cap on statewide greenhouse gas emissions and sets forth the regulatory framework to achieve the corresponding reduction in statewide emissions levels. AB 32 charges the California Air Resources Board (CARB), the state agency charged with regulating statewide air quality, with implementation of the act. Under AB 32, greenhouse gases are defined as: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Figure 3: California Climate Change Emissions and Targets



Source: California Air Resources Board

The regulatory steps laid out in AB 32 require CARB to: adopt early action measures to reduce GHGs on a statewide basis; to establish a statewide greenhouse gas emissions cap for 2020 based on 1990 emissions; to adopt mandatory reporting rules for significant source of greenhouse gases; and to adopt a scoping plan indicating how emission reductions will be achieved via regulations, market mechanisms and other actions; and to adopt the regulations needed to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gases.

CARB is circulating draft GHG regulations that affect residents, businesses and cities and counties in California. The regulations that affect cities include goals that offer agencies flexibility in being part of the effort to reduce greenhouse gas emissions.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an important environmental issue that requires analysis under CEQA. This bill directs the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the State Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, with certain exceptions, by July 1, 2009. The Resources Agency is required to certify or adopt those guidelines by January 1, 2010.

1.4. The Cities for Climate Protection Campaign

By adopting a resolution committing the City to locally advancing climate protection and becoming a member of ICLEI, San Carlos has joined an international movement of local governments. More than 800 local governments, including 440 in the United States, have joined ICLEI's Cities for Climate Protection (CCP) campaign. In addition to San Carlos, neighboring cities and the County of San Mateo are all members of ICLEI. Most Bay Area cities have committed to proactively addressing climate change.

The ICLEI CCP campaign provides a framework for local communities to identify and reduce greenhouse gas emissions, organized along five milestones:



1. Conduct an **inventory** of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions **reduction target**;
3. Develop a **climate action plan** for achieving the emissions reduction target;
4. **Implement** the climate action plan; and,
5. **Re-inventory** emissions to monitor and report on progress.

This report represents the completion of the first CCP milestone, and provides a foundation for future work to reduce greenhouse gas emissions in San Carlos.

2. San Carlos 2005 Greenhouse Gas Emissions Community Inventory

The process of conducting a GHG inventory is relatively new. GHG inventories originated as an international response to mitigate global climate change. Fundamentally, a GHG inventory measures the amount of heat trapping gases that an entity contributes to the atmosphere. By quantifying emissions, GHG generators are able to benchmark their status as emissions producers defining their "carbon footprint."

In 2006 the United States Environmental Protection Agency (EPA) completed the "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1900-2004" which defined a GHG inventory as follows:

"A greenhouse gas inventory is an accounting of the amount of greenhouse gases emitted to or removed from the atmosphere over a specific period of time (e.g., one year). A greenhouse gas inventory also provides information on the activities that cause emissions and removals, as well as background on the methods used to make the calculations. Policy makers use greenhouse gas inventories to track emission trends, develop strategies and policies and assess progress. Scientists use greenhouse gas inventories as inputs to atmospheric and economic models" (EPA, 2006).

The first step toward reducing greenhouse gas emissions is to identify baseline levels and sources of emissions in San Carlos. In the case of this baseline report, community wide emissions are presented to proactively plan for addressing emissions related to community wide emissions. Municipal emissions were not included in the calculations. As noted earlier, ICLEI, under contract to the City through the Joint Venture: Silicon Valley Climate Protection Task Force, is in the process of collecting City operations greenhouse gas data.

This being considered, community sector emissions in San Carlos, as in any City, are responsible for the bulk of emissions in San Carlos. When the municipal data becomes available it will be released in a separate baseline report and incorporated into the Climate Action Plan implementation. The information contained in this report will inform the selection of a reduction target and possible reduction measures through the Climate Action Plan process occurring concurrently with the San Carlos General Plan update process.

2.1. Methodology

The Joint Venture: Silicon Valley Climate Protection Task Force works with ICLEI's Cities for Climate Protection campaign to assist local governments in San Mateo and Santa Clara Counties to systematically track energy and waste related activities in the community, and to calculate the relative quantities of greenhouse gases produced by each activity and sector within individual communities. The Joint Venture: Silicon Valley Climate Protection Task Force's work allows for baseline inventories that are all based in the year 2005, allowing for a uniform approach to addressing baseline data and subsequently future emissions reduction strategies. This may also lead to a regional approach to establish baselines within Santa Clara and San Mateo Counties that will allow for a more efficient approach to implementing emission reduction measures through multiple cities and counties.

The greenhouse gas inventory protocol involves performing two assessments: a community wide assessment and a separate inventory of municipal facilities and activities. The municipal inventory is a subset of the community inventory and has not yet been separately analyzed for the City of San Carlos.

The community wide data currently includes the municipal operations, but it does not separate it out into a separate subset. This will take place in the future as the municipal specific data becomes available. Once completed, these inventories provide the basis for the creation of an emission forecast, and allow for the quantification of emissions reductions associated with proposed measures.

2.1.1. Clean Air and Climate Protection Software

To facilitate community efforts to reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package in partnership with the National Association of Clean Air Agencies (NACAA)², and Torrie Smith Associates. This software calculates emissions resulting from energy consumption and waste generation. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. CACP aggregates and reports the three main greenhouse gas emissions (CO₂, CH₄, and N₂O) in terms of equivalent carbon dioxide units, or CO₂e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane (CH₄) is twenty-one times more powerful than carbon dioxide on a per weight basis in its capacity to trap heat; so the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents.³ The CACP software is also capable of reporting input and output data in several formats, including detailed, aggregate, source-based and time-series reports.



The emissions coefficients and quantification method employed by the CACP software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605).

The CACP software has been and continues to be used by over 440 U.S. cities, towns, and counties to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides San Carlos with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data.

2.1.2. Creating the Inventory

This greenhouse gas emissions inventory is for the San Carlos community as a whole defined by its geographic borders. A second inventory addressing municipal specific emissions is currently in the data collection phase and will be used to augment the Climate Action Plan when it is completed. The municipal inventory is effectively a subset of the community-scale inventory (the two are not mutually exclusive). This allows the municipal government to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level. At the same time, the community-scale analysis provides a performance baseline against which the City can demonstrate progress being made throughout San Carlos.

Creating this emissions inventory required the collection of information from a variety of sources, including the Pacific Gas and Electric Company (PG&E), the Metropolitan Transportation Commission (MTC), the California Integrated Waste Management Board, CalTrans, and internal City records. Data from the year 2005 was used for the community inventory, with the exception of

² Now the National Association of Clean Air Agencies (NACAA)

³ The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential, or GWP. For more information on GWP see: IPCC Fourth Assessment Report, Working Group I, Chapter 2, Section 2.10.

a subset of the waste data, which utilizes a California statewide waste characterization study conducted in 2003-04.

For community activities, like government operations, ICLEI categorizes emissions sources by scope. The community scopes are:

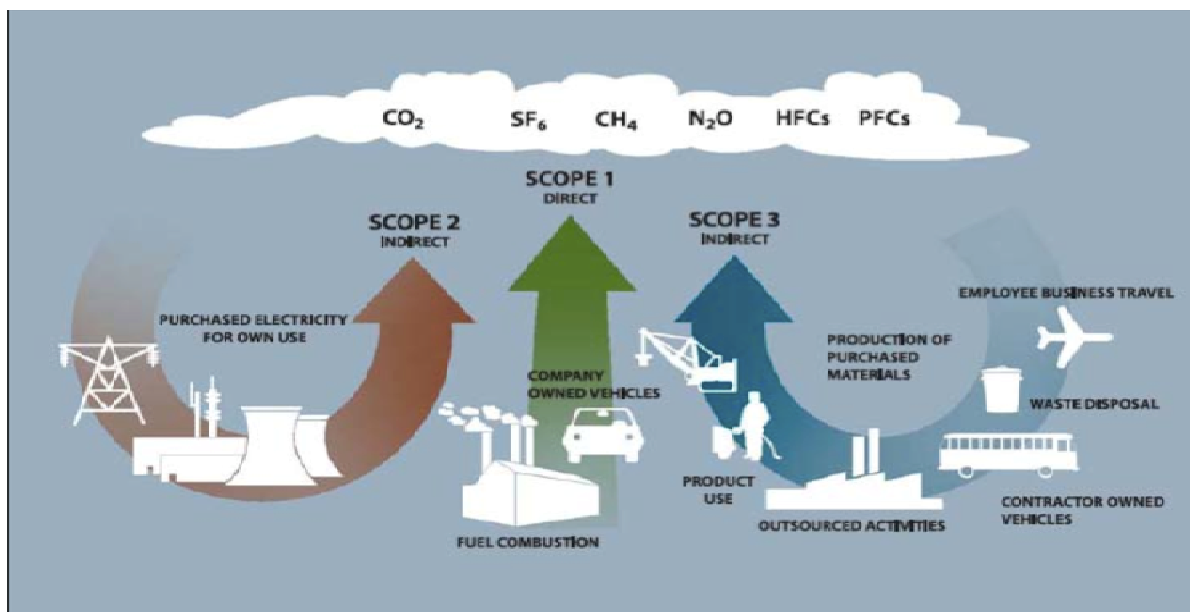
Scope 1 emissions are all direct emissions sources located within the geopolitical boundary of the local government. Examples of Scope 1 sources include use of fuels such as heavy fuel oil, natural gas or propane used for heating.

Scope 2 emissions are indirect emissions that result as a consequence of activity within the jurisdiction's geopolitical boundary limited to electricity, district heating, steam and cooling consumption. Examples of Scope 2 sources include purchased electricity used within the geopolitical boundaries of the jurisdiction associated with the generation of greenhouse gases at the power plant. These emissions should be included in the community-scale analysis, as they are the result of the community's electricity consumption.

Scope 3 emissions are all other indirect and embodied emissions that occur as a result of activity within the geopolitical boundary. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community which decomposes at landfills either inside or outside of the community's geopolitical boundary.

Information Items are biogenic emissions and other indicators which may be relevant to a complete understanding of a community's energy use and climate impact, but which are not conventionally included in greenhouse gas accounting. Examples of information items are biogenic carbon emissions or quantity of electricity generated from solar photovoltaic panels.

Figure 4 – Emissions Scopes



Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

Table 2 - Community-Scale Emissions Inventory Protocol Summary

Macro Sector (IPCC)		Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions
Energy	Stationary Combustion	Utility-delivered fuel consumption Decentralized fuel consumption Utility-consumed fuel for electricity / heat generation	n/a	Upstream/downstream emissions (e.g., mining/transport of coal)
	Electricity / Heat Consumption	n/a	Utility-delivered electricity / heat / steam consumption Decentralized electricity / heat / steam consumption	Upstream/downstream emissions (e.g., mining/transport of coal)
	Mobile Combustion	Tailpipe emissions from on-road vehicles Tailpipe emissions from rail, sea, airborne and non-road vehicles operating within the community	Electricity consumption associated with vehicle movement within the community (e.g., light rail)	Tailpipe emissions from vehicles used by community residents Upstream/downstream emissions (e.g., mining/transport of oil) Tailpipe emissions from rail, sea, and airborne vehicles departing from or arriving into the community
	Other Energy	Fugitive emissions not already accounted for	n/a	Upstream/downstream emissions
Industrial Processes and Product Use		Decentralized process emissions	n/a	Upstream/downstream emissions
Agriculture, Forestry and Other Land Use		Livestock methane, managed soils	n/a	Upstream/downstream emissions from fertilizer/pesticide manufacture
		Net biogenic carbon flux	n/a	n/a
Waste	Solid Waste Disposal	Direct emissions from landfill, incineration and compost facilities located inside the community	n/a	Landfill, incineration and compost emissions occurring in present-year from waste produced to date inside the community Future emissions associated with waste disposed Upstream/downstream emissions (e.g., transport to the landfill)
	Wastewater Treatment and Discharge	Direct emissions from wastewater facilities located inside the community	n/a	Wastewater emissions occurring in present-year from wastewater produced to date inside the community

The emissions inventory that was conducted for the community activities of San Carlos primarily contains emission sources falling within Scope 1, 2 and 3. Data availability, as well as time and budget constraints, meant that most Information Items were not included in the San Carlos emissions inventory.

2.1.3. Greenhouse Gases Measured

The greenhouses gases that are typically measured and monitored in GHG inventories are:

- carbon dioxide (CO₂)
- nitrous oxide (NO₂)
- methane (CH₄)
- sulfur hexafluoride (SF₆)
- perfluorocarbons (PFCs) and
- hydrofluorocarbons (HFCs).

The CACP software does not, however, quantify the amounts of these individual gases. Instead, the CACP software quantifies all GHG emissions in CO₂ equivalency (CO₂e), allowing for easy comparison between separate gases. Due to the scale of this project all results are conveyed in metric tonnes of carbon dioxide equivalency (MTCO₂e). A metric tonne is equivalent to 2,205 pounds, and one pound of CO₂ can fill approximately 120 party balloons. This means that one MTCO₂e could fill more than 250,000 party balloons.

There are five criteria air pollutant (CAP) emissions inventoried in this project. These pollutants harm both human health and the environment though they do not contribute directly to global climate change. They are carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, and particulate matter smaller than 10mm.

1. Carbon monoxide (CO) — Can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues.
2. Sulfur dioxide (SO₂) — Contributes to respiratory illness, particularly in children and the elderly, and aggravates existing heart and lung diseases. SO₂ contributes to the formation of acid rain, which: damages trees, crops, historic buildings, and monuments; and makes soils, lakes, and streams acidic. SO₂ also contributes to the formation of atmospheric particles that cause visibility impairment, most noticeably in national parks.
3. Nitrogen oxides (NO_x) — Causes a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including nitrogen dioxide, nitric acid, nitrous oxide, nitrates, and nitric oxide.
4. Volatile organic compounds (VOCs) — Includes a variety of chemicals associated with short and long term adverse health effects. VOCs also participate in photochemical reactions.
5. Particulate matter (PM₁₀) — Fine particles that contain microscopic solids or liquid droplets that are so small that they can get deep into the lungs. Particulate matter can cause respiratory health problems such as decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, non-fatal heart attacks, and premature death in people with heart or lung disease.

2.2. Inventory Results

2.2.1. Community Emissions Inventory

There are numerous items that can be included in a community scale emissions inventory, as demonstrated above. This inventory includes Scope 1, Scope 2, and Scope 3⁴ sources from the following sectors:

- Residential
- Commercial / Industrial
- Transportation
- Waste

Table 3 – *Emission Sources Included in 2005 Community Inventory by Scope and Sector*

Sector	Scope 1	Scope 2	Scope 3
Residential	<i>Natural Gas</i>	<i>Electricity</i>	
Commercial / Industrial	<i>Natural Gas</i>	<i>Electricity</i>	
Transportation	<i>Gasoline & Diesel</i>		<i>Caltrain Diesel</i>
Waste			<i>Methane from Decomposition</i>

Including all scopes and information items, the community of San Carlos emitted approximately 231,057 metric tons⁵ of CO₂e in the year 2005. As shown in Figure 5 and Table 4, Scope 1 emissions

⁴ Please see pp. 6-7 for detailed explanations of the various Scopes.

were by far the largest source community-wide emissions (78.5%%), with Scope 2 (16.9%) and Information Items (4.6%) constituting the remainder.

As shown in Table 5 and Figure 6 below, the largest percentage of Scope 1 emissions came from the transportation sector (69.4%).

Figure 5 - 2005 Community GHG Emissions by Scope

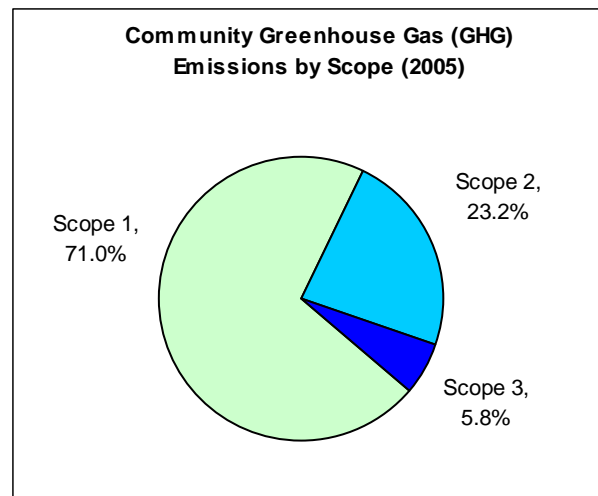


Table 4 – Community GHG Emissions per Sector per Scope (metric tons of CO₂e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Residential	32,858	16,320		49,178
Commercial / Industrial	17,266	37,352		54,618
Transportation	114,484		702	115,186
Waste			12,778	12,778
TOTAL	164,608	53,672	13,480	231,760
Percentage of Total CO₂e	71.0%	23.2%	5.8%	100.0%

The largest percentage of 2005 Scope 2 emissions (69.6%) was generated by the Commercial / Industrial Sector (Table 6 and Figure 7), and the remainder (30.4%) came from the Residential Sector. All of San Carlos' Scope 2 emissions came from electricity consumption within city boundaries.

Table 5 – Community Scope 1 GHG Emissions (metric tons CO₂e)

Scope 1 Emissions By Sector	Residential	Commercial / Industrial	Transportation	TOTAL
CO₂e (metric tons)	32,858	17,266	113,781	163,905
Percentage of Total CO₂e	20.0%	10.5%	69.4%	100.0%
Energy Use (MMBtu)	617,574	324,531	1,557,935	2,500,040

5 All emissions estimated using the Clean Air and Climate Protection Software. See Appendices for information on emissions factors, etc.

Table 6 - *Community Scope 2 GHG Emissions (metric tons CO₂e)*

Scope 2 Emissions By Sector	Residential	Commercial / Industrial	TOTAL
CO ₂ e (metric tons)	16,320	37,352	53,672
Percentage of Total CO ₂ e	30.4%	69.6%	100.0%
Energy Use (MMBtu)	249,152	531,572	780,724

Figure 6 – *Community Scope 1 Emissions*

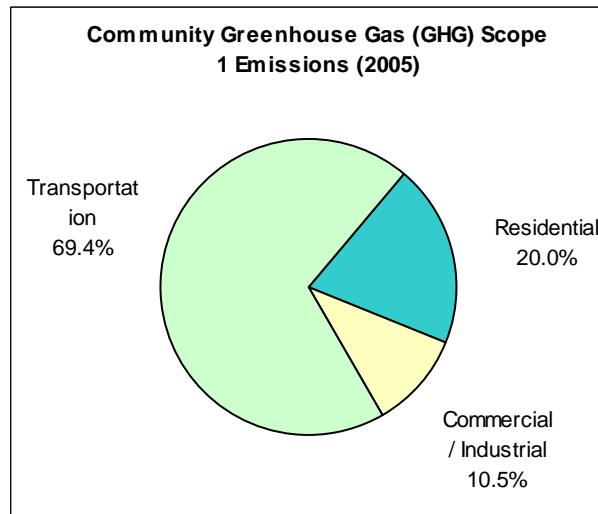
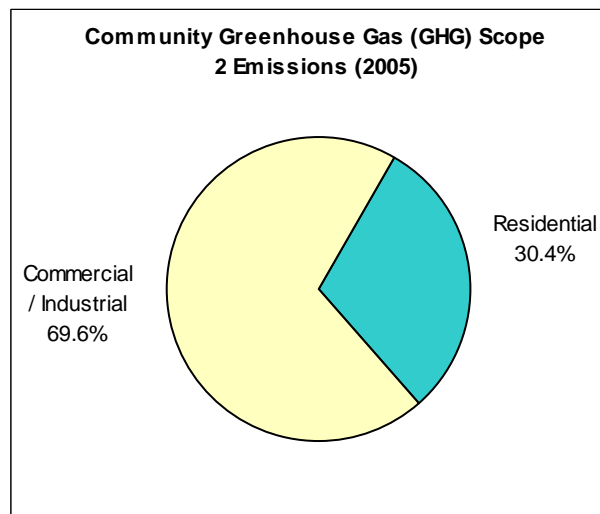


Figure 7 – *Community Scope 2 Emissions*



The remaining portion of emissions included in the San Carlos 2005 community inventory fall under the category of Scope 3. All emissions in this category are an estimate of future emissions over the lifecycle decomposition of waste and alternative daily cover (ADC) sent to landfill in the base year (2005).⁶

All-Scope Emissions by Sector

In the base year 2005, the community of San Carlos emitted approximately 231,057 metric tons of CO₂e. As shown in Table 7 and 8, and illustrated in Figure 8 below, the transportation (49.5%) and residential (21.3%) sectors were the largest sources of greenhouse gas emissions. Emissions from the commercial/industrial sector and waste contributed 23.6% and 5.5% respectively. Table 15 breaks down greenhouse gas emissions by energy source. The burning of gasoline, electricity, and natural gas was responsible for most of the greenhouse gas emissions in San Carlos with 45.1%, 23.2%, and 21.7%. The remaining categories, with the exception of diesel, are landfill materials that emitted methane and carbon dioxide.

⁶ See below for more detail on emissions from the waste sector.

Table 7, *Community Greenhouse Gas Emissions Input and Output Summary*

Sector	Emission Source	Input Data	Output Data CO ₂ e (metric tons/year)
Residential	Electricity Consumption	73,001,423 kWh	16,320
	Natural Gas Consumption	6,175,743 Therms	32,858
	<i>Subtotal</i>		49,178
Commercial / Industrial	Electricity Consumption	1,557,50,225 kWh	37,352
	Natural Gas Consumption	3,245,306 Therms	17,267
	<i>Subtotal</i>		54,619
Transportation	Highway Gasoline and Diesel Consumption (VMT)	124.8 million Annual VMT (96.8% Gasoline 3.2% Diesel)	60,947
	City Roadway Gasoline and Diesel Consumption (VMT)	108.2 million Annual VMT (96.8% Gasoline 3.2% Diesel)	52,834
	CalTrain Diesel consumption for San Carlos commuters	68,726.78 gallons of diesel annually	702
	<i>Subtotal</i>		114,483
Waste	Lifetime Decomposition of Waste Generated	45,439 Tons	12,590
	Lifetime Decomposition of Alternative Daily Cover	834 Tons	187
	<i>Subtotal</i>		12,777
Total			231,057

Figure 8 – *Community GHG Emissions by Sector*

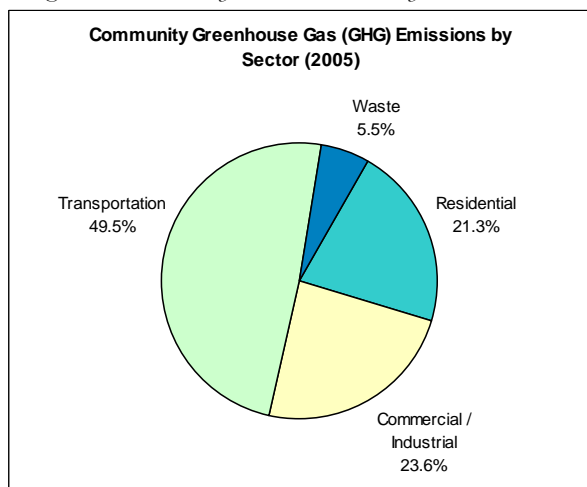


Figure 9 – *Community GHG Emissions by Sector*

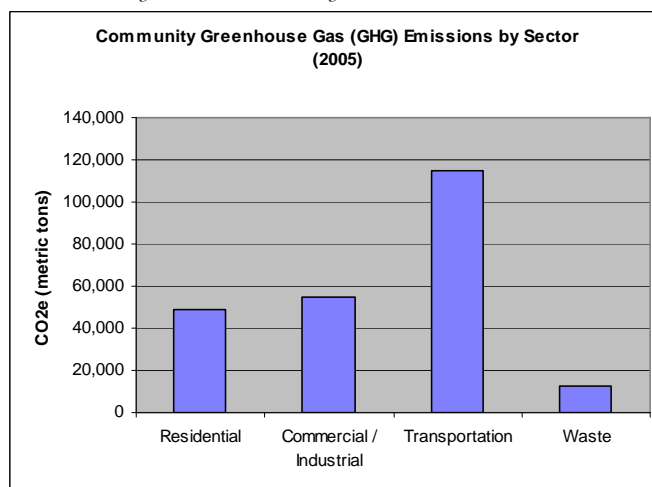


Table 8 – Community GHG Emissions by Sector (metric tons CO₂e)

2005 Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO ₂ e (metric tons)	49,178	54,619	114,483	12,777	231,057
Percentage of Total CO ₂ e	21.3%	23.6%	49.5%	5.5%	100.0%
Energy Use (MMBtu)	866,726	856,101	1,566,320	0	3,289,147

Transportation Sector Emissions

The transportation sector's relative contribution to greenhouse gas emissions is equivalent to other San Francisco Bay area cities at 49.5% of total CO₂e. Travel by motorized vehicle constitutes a significant percentage of greenhouse gas emissions. Approximately 46.2% of the emissions in the transportation sector came from travel on city roads. This number can be reduced dramatically by making it easier for residents to use alternative modes of transportation, including walking, bicycling, and riding public transportation. According to the Federal Highway Administration, VMT nationwide fell by 0.4% in the last year, ending in February 2008, showing a direct relationship between a disincentive such as high fuel price, and behavior of the average driver. Because San Carlos contains the heavily traveled Highway 101 within its borders, 53.2% of the greenhouse gas emissions in the transportation sector are a result of highway travel.

The remaining 0.6% of emissions is from Caltrain diesel consumption as a result of San Carlos weekday commuting patterns. These emissions call under Scope 3 because, although San Carlos commuters are responsible for their production, the emissions are released throughout the Bay Area. Caltrain diesel consumption was based on 2005 ridership averages during commuting hours as well as average trip distances and fuel efficiency estimates by Caltrain. Appendix C includes the sources, assumptions, and calculations for the Caltrain output.

Figure 10 – Community GHG Emissions by Road Type

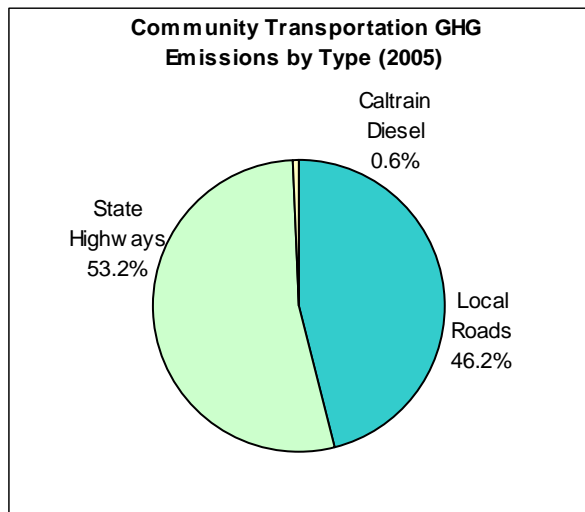


Figure 11 – Community GHG Emissions by Fuel Type

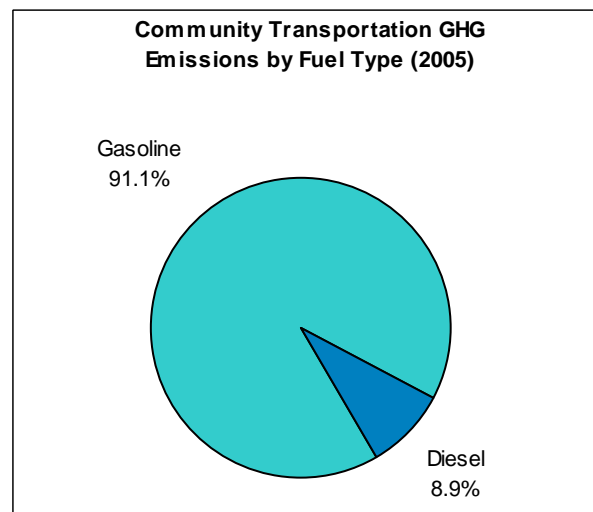


Table 9 – *Transportation GHG Emissions by Type*

Transportation Road Type Emissions Sources 2005	Local Roads	State Highways	Caltrain Diesel	TOTAL
CO ₂ e (metric tons)	52,834	60,947	702	114,483
Percentage of Total CO ₂ e	46.2%	53.2%	0.6%	100.0%
Energy Use (MMBtu)	723,413	834,522	8,386	1,566,321

Table 10 -- *Transportation GHG Emissions by Fuel Source*

Transportation Fuel Emissions Sources 2005	Gasoline	Diesel	TOTAL
CO ₂ e (metric tons)	104,255	10,229	114,484
Percentage of Total CO ₂ e	91.1%	8.9%	100%
Energy Use (MMBtu)	1,445,602	120,719	1,566,321

According to the peer-reviewed international emissions inventory protocol that ICLEI is currently finalizing, all significant emissions that occur within a local government's jurisdictional boundaries should be included in a local greenhouse gas emissions inventory, including emissions from vehicles that travel on the highways that fall within a local government's boundaries. The protocol also states that different types of emissions (direct, indirect, and other) should not be aggregated. For the transportation sector this means that the emissions from highway vehicles and Caltrain are not aggregated with emissions from local road vehicles.

The main reason for this is that local governments have a much greater degree of control over local traffic patterns than they do over highways and rail transit. In addition, a large portion of the vehicle miles traveled on highways is from pass-through traffic--vehicles that do not stop in the city.

Emissions from the airport located within the City of San Carlos were not included due to the difficulty of collecting this information and lack of a protocol for calculating CO₂e. With more time and the availability of suitable proxy data, the greenhouse gas emissions from air travel and the airport could be estimated. Since air travel and the airport are forms of transportation that the municipal government of San Carlos have little influence or control over, it is reasonable to exclude these from this inventory at this time.

The Built Environment (Residential, Commercial, Industrial)

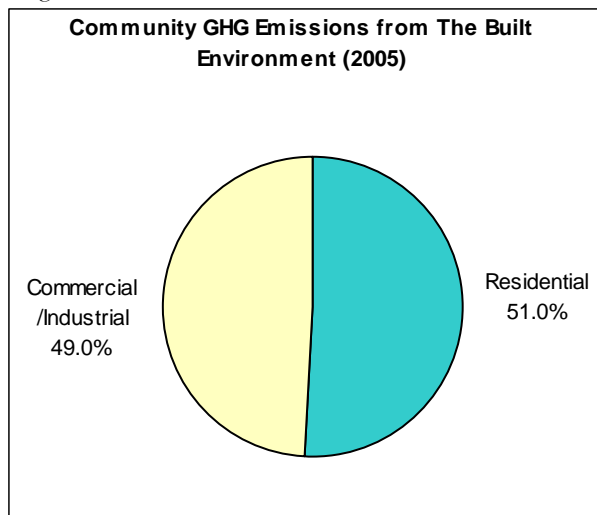
With all scopes aggregated, 44.9% of total community wide emissions in the year 2005 came from the “built environment.” The built environment is comprised of the Residential, Commercial and Industrial Sectors. Within this report the Commercial and Industrial Sectors have been combined due to a mandatory aggregating of Commercial and Industrial data by PG&E⁷, and due to the fact that there is little Industrial activity in San Carlos.

San Carlos’ 2005 emissions from the built environment were almost evenly split between the Commercial / Industrial Sector and the Residential Sector (Figure 12). All of the emissions calculated from the built environment were the result of local natural gas consumption (Scope 1) and local consumption of electricity that was generated outside of San Carlos (Scope 2.) Approximately two-thirds of emissions in the Residential Sector resulted from the combustion of

⁷ See Appendix A for details on methodology and data constraints.

natural gas for heating and cooking (see Figure 13 and Table 11), while it is nearly the opposite in the Commercial / Industrial Sector (see Figure 14 and Table 12), where the largest percentage of emissions came from electricity consumption.

Figure 12 – Built Environment Emissions



It is useful to consider the causes behind significant variations in data when developing policies and programs to reduce emissions from each sector. For example, the policies that would aim to reduce emissions from the Commercial/ Industrial Sector may differ from those aiming to reduce emissions from the Residential Sector based upon the information above (and in the figures and tables below). In this regard, the emissions inventory provides valuable insight into policy development strategies.

ICLEI estimated industrial and commercial GHG emissions by combining data from PG&E on electricity and natural gas consumption with estimates on Direct Access (DA) electricity provided to industries.⁸ The Direct Access data included in this inventory were derived from two sources: PG&E and the California Energy Commission (CEC). PG&E provided a small record of DA electricity consumption (2,576,1087 kWh), and the CEC provided an estimate on 2005 DA electricity consumption within San Mateo County at large. The countywide DA consumption figures provided by the CEC were used to calculate the countywide proportion of DA usage to PG&E usage, which was in turn used to estimate the proportion of DA electricity consumed within the San Carlos. It is important to note that the Direct Access data included in the inventory may not be comprehensive given that is solely based on regional estimates.

In addition to emissions from natural gas and electricity consumption, there are major emissions sources within the Commercial / Industrial Sector that are not currently included in this inventory. These sources include fuel refineries, on-site combustion of fuel oil, diesel, etc., and off-road mobile equipment such as fork-lifts and cranes. Due to scope and data availability, data pertinent to these sources were not procured for this report. As a proxy, the Bay Area Air Quality Management District (BAAQMD) recently released a preliminary study on the top 200 largest GHG emitting facilities in the Bay Area.

⁸ Direct Access electricity refers to electricity purchased directly by industries from power generation facilities, which is then delivered through the transmission lines of public or private utility.

Figure 13 – Residential Emissions

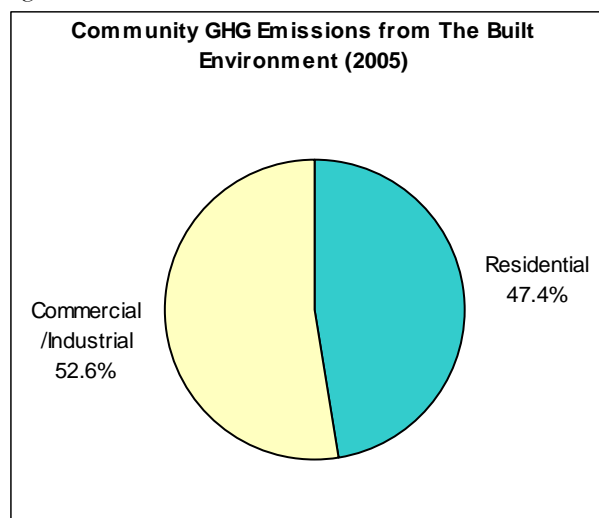


Figure 14 – Commercial / Industrial Emissions

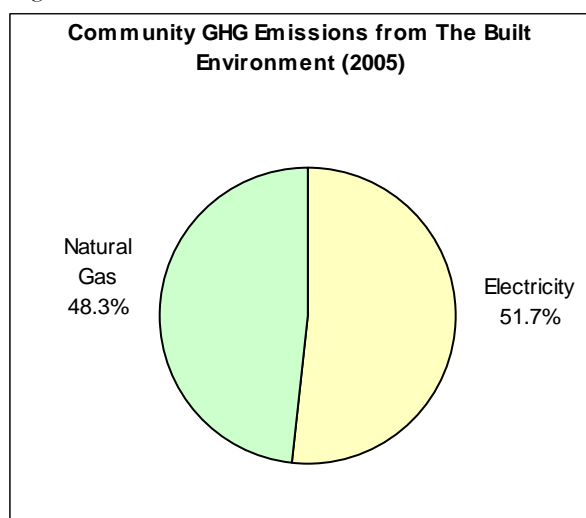


Table 11 – Residential GHG Emissions Sources

Residential Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO ₂ e (metric tons)	16,320	32,858	49,178
Percentage of Total CO ₂ e	33.2%	66.8%	100%
Energy Use (MMBtu)	249,152	617,574	866,726

Table 12 – Commercial / Industrial GHG Emissions Sources

RCI Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO ₂ e (metric tons)	53,672	50,124	103,796
Percentage of Total CO ₂ e	51.7%	48.3%	100%
Energy Use (MMBtu)	780,724	942,105	1,722,829

Waste Sector Emissions

The waste sector contributed 5.5% of San Carlos' total CO₂e in 2005. Because of the large amount of waste in county's closed landfills and the inherent difficulty in containing and capturing gases in large heterogeneous landfills, all landfills emitted nearly 760,000 metric tons of methane in CO₂e in 2005. This is despite the fact that six of the eight county landfills are closed and none are placed within the San Carlos City Limits. The emissions from waste generated by San Carlos residents and businesses that was landfilled in other locations in 2005 emitted 12,777 metric tons of CO₂e, accounting for 5.5% of the City's total emissions.

Table 13: Greenhouse Gas Emissions from Landfills in San Mateo County, 2005

City	Landfill	Status	Emissions (Methane in Metric tons of CO ₂ e)
Colma	Hillside Landfill	open	89,199
Half Moon Bay	Ox Mountain Landfill	open	405,965
Brisbane	Brisbane Landfill	closed	20,742
Burlingame	Burlingame Landfill	closed	10,796
Menlo Park	Marsh Rd Landfill	closed	43,533
Colma	Metro Bay Center Landfill	closed	3,512
Mountain View	Portion of Vista Landfill	closed	5,100
Mountain View	Shoreline	closed	177,302
Total			756,148

The waste sector of both the community and municipal inventories deserves additional explanation because of the particular challenges in measuring the amount of methane that is released from landfills. The CACP Software is designed to be used in communities with a variety of waste disposal methods including managed landfills, open dumps, and incineration.

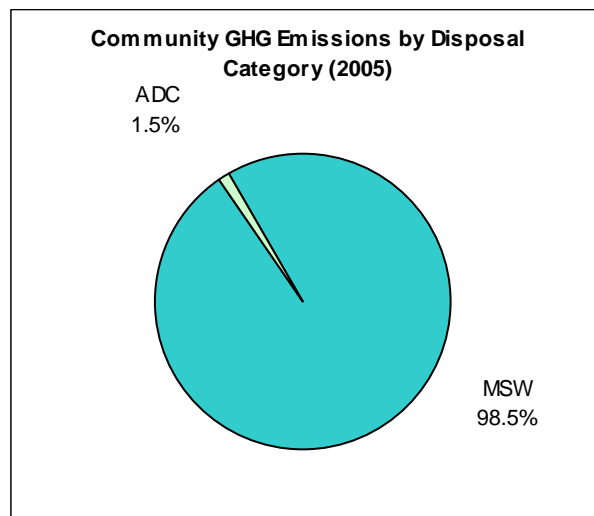
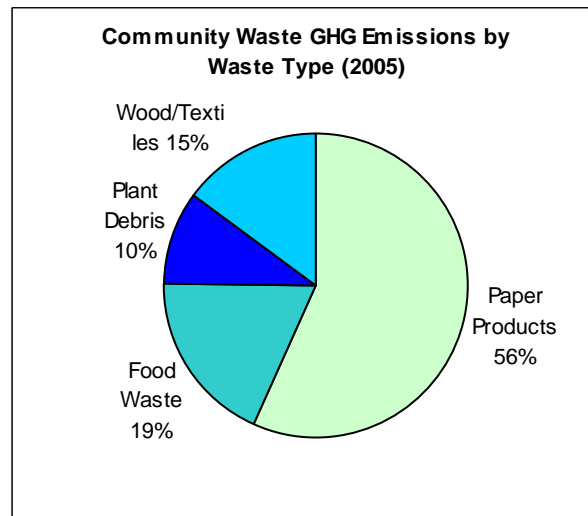
Emissions from the waste sector in San Carlos came from one type of source called Methane Commitment which involves waste that was generated by residents and activities taking place within the City limits that was disposed of in landfills outside of the City.

In accordance with the inventory guidelines that are outlined in the Methods section above, this source type is categorized as a Scope 3.

For Methane Commitment, greenhouse gas emissions were calculated using a version of the EPA's Waste Reduction Model (WARM), which is embedded within the CACP Software. WARM calculates the emissions that will occur during the lifetime of waste that is disposed of using a variety of waste disposal technologies, including landfilling, recycling, incineration, composting, and source reduction. These calculations are primarily based on the composition of the waste and the waste disposal technology employed, including methane capture.

The model calculates emissions occurring in the inventory year based on the amount of decomposable waste in a landfill, the waste's methane generation potential, and an exponential time constant of decay.

It is also important to note that while waste-reduction through recycling does not overtly show up in this inventory, recycling saves a substantial amount of energy by reducing the need for virgin inputs, and by diverting paper products from landfills, which reduces the amount of landfill gas that is produced. The emissions benefits of recycling can be quantified when analyzing recycling as an emissions reduction strategy relative to the base year.

Figure 15 -- *Waste GHG Emissions by Category*Figure 16 -- *Waste GHG Emissions by Type*Table 14 -- *Waste GHG Emissions by Disposal Category*

Waste Emissions Categories 2005	MSW	ADC	TOTAL
CO ₂ e (metric tons)	12,590	187	12,777
Percentage of Total CO ₂ e	98.5%	1.5%	100.0%
Energy Use (MMBtu)	0	0	0

Table 15 -- *Waste GHG Emissions by Waste Type*

Waste Emissions Sources 2005	Paper Products	Food Waste	Plant Debris	Wood/Textiles	TOTAL
CO ₂ e (metric tons)	7,228	2,395	1,239	1,916	12,778
Percentage of Total CO ₂ e	56.6%	18.7%	9.7%	15.0%	100%
Energy Use (MMBtu)	0	0	0	0	0

Community Emissions by Source

In addition to viewing emission by sector and by scope, it can be useful for building policy and programs to analyze emissions according to their raw fuel or waste source. Figure 17 and Table 16 below show that *more than 45.1%* of all community emissions come from the consumption of gasoline on local roads and highways. These emissions, along with emissions from diesel consumption (4.4%), are the actual source of the 49.5% figure for the Transportation Sector. Natural gas (21.7%) and electricity (23.2%) consumption from the built environment are the next most significant figures, with the remainder coming from the various waste types.

Figure 17 – *Community GHG Emissions by Source*

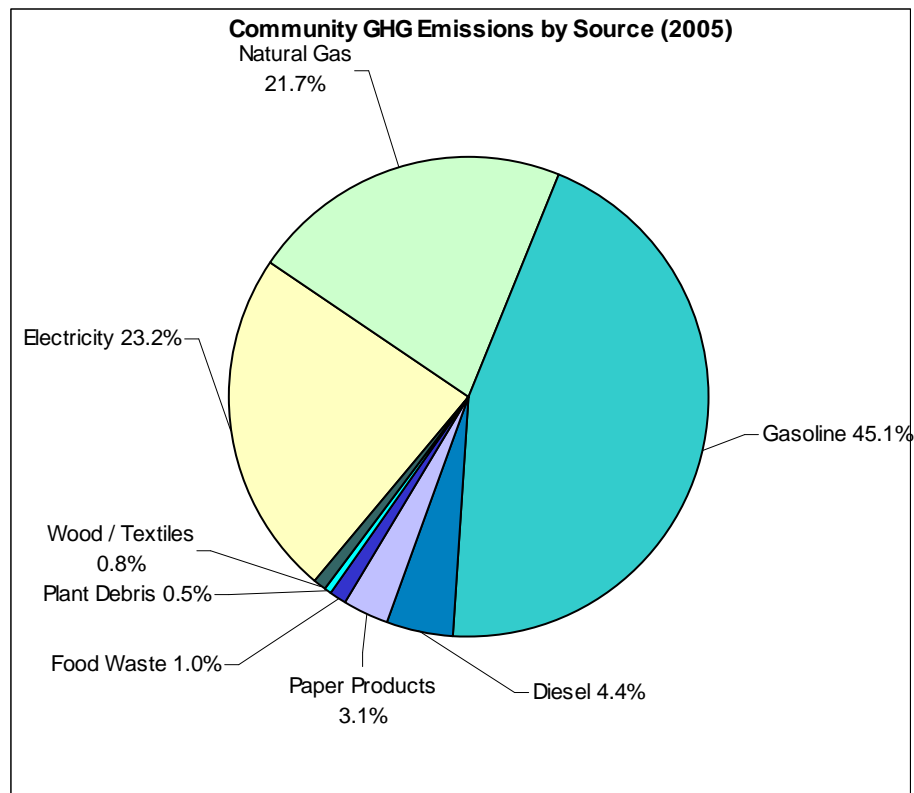


Table 16 – *Community GHG Emissions by Source*

Community Emissions 2005 by Source	CO ₂ e (metric tons)	CO ₂ e (percent of total)	MMBtu
Electricity	53,672	23.2%	780,722
Natural Gas	50,125	21.7%	942,105
Gasoline	104,255	45.1%	1,445,602
Diesel	10,228	4.4%	120,718
Paper Products	7,228	3.1%	0
Food Waste	2,395	1.0%	0
Plant Debris	1,239	0.5%	0
Wood / Textiles	1,916	0.8%	0
TOTAL	231,058	100.0%	3,289,147

Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. Currently it is difficult to make meaningful comparisons between cities because of variation in the scope of inventories conducted, but in the near future a universal reporting standard will be developed and adopted through a process being driven by ICLEI, making this possible.

Dividing the total greenhouse gas emissions of the community (231,057 metric tons of CO₂e) by population (28,105 people) yields a result of 8.22 metric tons of CO₂e per capita. It is important to understand that this number is not the same as the carbon footprint of the average individual living in San Carlos, which is the estimated total emission associated with an individual. Rather, this number is the per capita CO₂e within the City of San Carlos. Downstream and upstream emissions are not quantified. The goal of the baseline report is to outline emission factors that can be influenced by the City, rather than all emissions associated with individuals within the City. Comparatively, the City of Menlo Park had a per capita emissions rate of 14.7 MMTCO₂e, California has a per capita emissions rate of 12 MMT CO₂e in 2005 and the nation as a whole had a per capita emissions rate of 24.1 MMT CO₂e in 2004.

Although this comparison show San Carlos well below other per capita emission rates, it is important to note that the per capita emissions number for San Carlos is not directly comparable to other per capita numbers produced by other emissions studies because of differences in emission inventory methods.

2.2.2. Municipal Operations Emissions Inventory

Municipal emissions in San Carlos likely constitute 1% to 5% of the community's total greenhouse gas emissions assuming San Carlos municipal emissions are similar in nature to other cities in the Bay Area. This is not unusual; local government emissions typically account for around two percent of community levels.

As a minor contributor to total emissions, actions to reduce municipal energy use will have a limited impact on the San Carlos community's overall emissions levels. However, as previously mentioned, municipal action has symbolic value that extends beyond the magnitude of emissions actually reduced.

When municipal emissions specific data is collected, it will be released as a separate baseline analysis and used to implement emissions reduction measures in the Climate Action Plan. Specific emissions data that will be presented include municipal building, street lights, waste, water and stormwater pumping, and vehicle fleet data.

Please see Appendix B for a list climate change and emission reduction programs in which San Carlos currently participates

3. 2020 Forecast

If the community of San Carlos continues with the 2005 pattern of energy consumption, travel, and waste production, the rate of greenhouse gas emissions will increase to 280,655 metric tons of CO₂e per year by 2020. This "business as usual forecast" is 17% higher than 2005 levels due to estimated increases in population, households, and commercial activity. The Association of Bay Area Governments (ABAG) projections for population, household, and job growth were used to provide consistency among Bay Area cities.

As shown in Table 18 and illustrated in Figure 18, the greenhouse gas emissions from transportation and commercial / industrial activity are projected to increase at higher rates than the residential and waste sectors. This most likely is due to a low estimate of household growth by the ABAG (0.7%).

As the City moves forward with the Climate Action Plan, the transportation and commercial / industrial sectors will be given greater attention.

Figure 18, *Emissions Forecast for 2020*

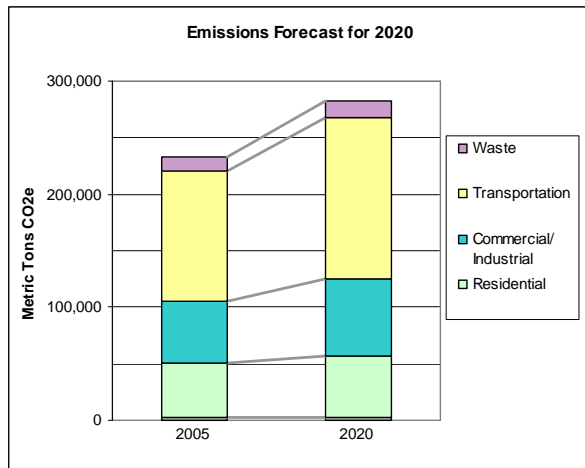


Table 17, *Emissions forecast for 2020 by Sector*

2005 Community Emissions Growth Forecast by Sector	2005	2020	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	49,178	54,638	0.704%	11.1%
Commercial/ Industrial	54,619	68,344	1.506%	25.1%
Transportation	114,483	143,310	1.509%	25.2%
Waste	12,777	14,363	0.783%	12.4%
TOTAL	231,057	280,655	--	21.5%

Figure 19: *San Carlos' 2020 Greenhouse Gas Emission Scenarios*

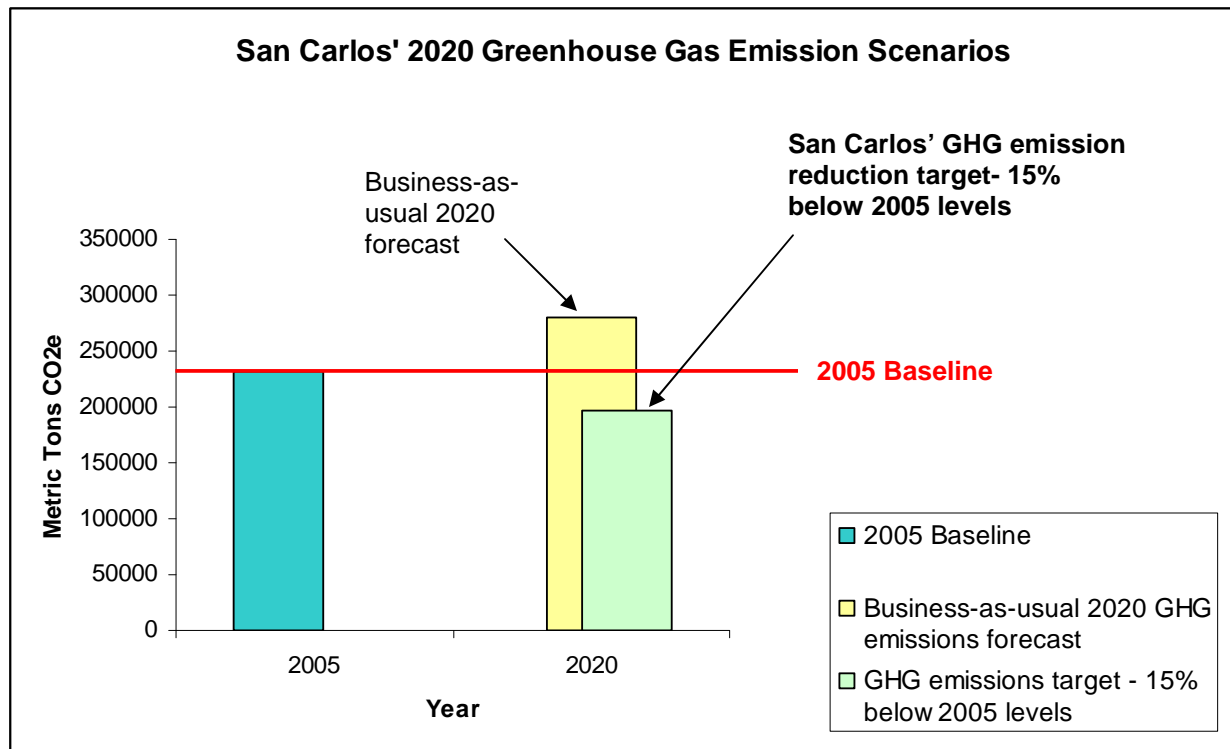
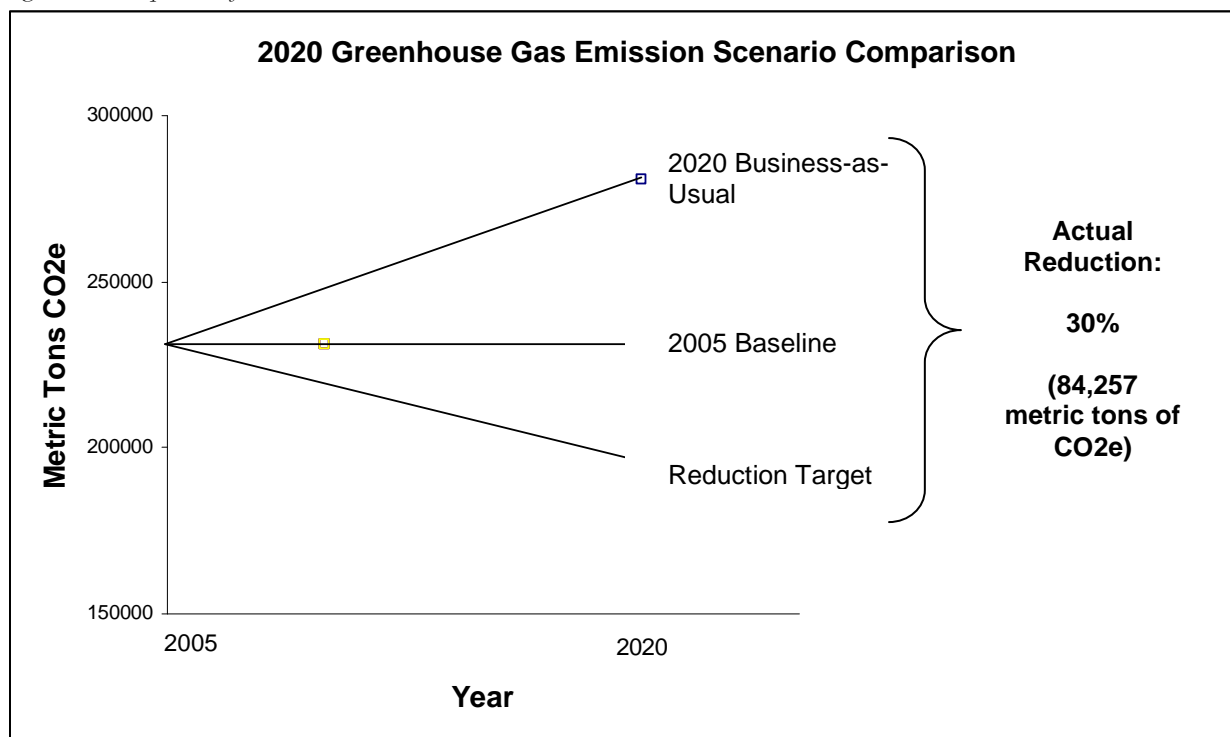


Figure 20: *Comparison of 2020 Greenhouse Gas Emissions Scenarios*



4. Conclusion

In passing a resolution to sign the San Carlos Climate Protection Letter, the City of San Carlos made a formal commitment to reduce its greenhouse gas emissions. This report lays the groundwork for those efforts by estimating baseline emission levels against which future progress can be demonstrated.

This analysis found that the City of San Carlos community as a whole was responsible for emitting *231,057 metric tons of CO₂e in the base year 2005*, with the Transportation Sector contributing the most (49.5%) to this total.

The ICLEI forecast tool found that if the community of San Carlos will emit 280,655 metric tons (17% more) greenhouse gas emissions in the year 2020 under ‘business-as-usual.’ The highest rate of increase is due to the transportation and commercial/industrial sector.

In addition to establishing the baseline for tracking progress over time and 2020 forecast to plan for the future, this report serves to identify the major sources of San Carlos’ emissions, and therefore the greatest opportunities for emission reductions. In this regard, the emissions inventory ought to inform the focus of the San Carlos Climate Action Plan currently underway.

Following the ICLEI methodology, the City of San Carlos utilized the first draft of this inventory to set a greenhouse gas reduction target of 15% below 2005 levels by 2020. The City is currently working to create the Climate Action Plan and to identify and quantify the emission reduction benefits of projects that have already been implemented since 2005, as well as the emissions reduction benefits of proposed green policies and climate protection measures. The benefits of both existing and proposed strategies can be tallied against the baseline established in this report to determine the appropriate set of strategies that will deliver the community of San Carlos to its chosen emissions reduction goal of 15% below 2005 levels by 2020.

5. Appendices

Appendix A

San Carlos Climate Protection Letter

RESOLUTION NO. 2008-029

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN CARLOS ADOPTING THE SAN CARLOS CLIMATE PROTECTION LETTER

WHEREAS, the Inter-Governmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, has found that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution; and

WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century; a 40 percent decline in Arctic sea-ice thickness; and nine of the ten hottest years on record occurring in the past decade; and

WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; more frequent and greater concentrations of smog; and

WHEREAS, the United States of America, with less than five percent of the world's population, is responsible for producing approximately 25 percent of the world's global warming pollutants; and

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility have also publicly expressed preference for the US to adopt precise and mandatory emissions targets and timetables as a means by which to remain competitive in the international marketplace, to mitigate financial risk and to promote sound investment decisions; and

WHEREAS, state and local governments throughout the United States are adopting emission reduction targets and programs and that this leadership is bipartisan, coming from Republican and Democratic governors and mayors alike; and

WHEREAS, many cities throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

NOW, THEREFORE, BE IT RESOLVED, the San Carlos City Council authorizes the Mayor to Sign and Issue the San Carlos Climate Protection Letter that reads as follows:

The City of San Carlos Climate Protection Letter

a. We urge the federal government and state governments to work to reduce global warming pollution levels, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel efficient technologies such as conservation, methane recovery for energy generation, waste to energy, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;

b. We will continue to work on programs that strive to reduce global warming pollution. This may include programs such as:

1. Inventory global warming emissions in City operations and in the Community;
2. Develop and Adopt a General Plan that includes a discussion of Climate Change and a Climate Action Plan;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Explore the use of clean, alternative energy;
5. Continue to make energy efficiency a priority, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Continue to increase the average fuel efficiency of municipal fleet vehicles through steps including the purchase of Hybrid powered vehicles;
7. Work to increase recycling rates in City operations and in the community;
8. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution, and
9. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO2.


BE IT FURTHER RESOLVED The City of San Carlos will work with its residents and businesses as well as in conjunction with neighboring cities, counties and other agencies interested in this matter to progress on reduce greenhouse gas emissions and to reduce global warming pollution levels.


I, Christine D. Boland, City Clerk, hereby certify that this Resolution was passed and adopted by the City Council of the City of San Carlos at a regular meeting held on the 27th day of May, 2008, by the following vote:

AYES, COUNCILMEMBERS: AHMAD, GRASSILLI, LEWIS, ROYCE

NOES, COUNCILMEMBERS: GROCOTT

ABSENT, COUNCILMEMBERS: NONE


City Clerk of the City of San Carlos

APPROVED:

Brad Lewis, Mayor
City of San Carlos

Appendix B

San Carlos Climate Change and Emission Reduction Program Participation

In San Carlos, the City has teamed up with several groups to advance this work including the San Carlos Chamber of Commerce, the South Bayside Waste Management Authority (SBWMA) and San Carlos Green to bring these programs and efforts to a city-wide audience of residents and businesses. The City Staff handles Green Programs at the City Government, the Chamber of Commerce works with the business community, the SBWMA offers solid waste, recycling and green programs to San Carlos residents and businesses and San Carlos Green works with San Carlos residents.

Regionally, San Carlos is a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative and its Assistant City Manager is on the program's Executive Committee. This regional initiative works to develop and coordinate Climate Protection programs for all 42 cities and counties in Silicon Valley. This includes efficient and cost effective data collection for inclusion in baseline reports in municipalities in San Mateo and Santa Clara Counties as well as the balance of Silicon Valley, informational briefings on Solar Power, Energy Efficiency programs, community programs such as Green Neighbors, joint Solar Procurement projects, policy development, Green Building Codes and several other projects now underway on a regional level.

City Programs

The City of San Carlos was an early leader in several Green Program areas including the recycling of office paper, LED traffic signal lights, relamping of City Hall to reduce energy usage and costs and an award winning photovoltaic installation at the City Corporation Yard on Bransten Road. In the past year, the City teamed up with the South Bayside Waste Management Authority (SBWMA) to give away compost to San Carlos residents, conducting an eWaste event in July (and another planned for October) and to pilot a Residential Battery and Cell Phone Curbside Recycling Program that was so successful that it is now in place for residents at all 12 SBWMA member agencies.

City Council Approval of Green Programs and Climate Protection Work

On May 14 2007, the City Council considered a report from the City Staff to expand the City's Green Programs and to launch an effort to work on Climate Change and Climate Protection. It included a Community Solar Discount Program in partnership with Solar City, San Carlos Green, Joint Venture: Silicon Valley Climate Protection Initiative, San Mateo County Green Business Program and other regional programs in this area. The City Council directed the City staff to move ahead with these recommendations and expanded the City's Green and Climate Programs.

Certified Green Businesses in San Carlos

At the invitation of San Mateo County Supervisor Mark Church and the County's Recycle Works.Org Division, San Carlos became one of 6 cities in San Mateo County to pilot this County's participation in the Bay Area Green Business Program last year.

The program, which started 10 years ago in Alameda County is sponsored by the Association of Bay Area Governments (ABAG) and encourages local businesses of all sizes to adopt Green Business Practices and then to participate in a certification process. Certification involves completing an 11 page checklist, working with the City and inspections by local utilities and regulators and the County to insure compliance with Green standards. Certified Green Businesses receive a Green Business Program window sticker for their firm, Green Business artwork for their web site and a listing in a Bay Area Green Business Guide that now tops 1,000 firms. San Carlos now has 17 Certified Green Businesses, the largest number in San Mateo County. This demonstrates the business community's commitment to taking steps to participate in the City's Green Programs.

San Carlos Businesses and the Chamber of Commerce Green Task Force

Businesses in San Carlos have been active in Green Programs and Climate Protection in cooperation with the City. The San Carlos Chamber of Commerce is playing a leading role through their creation of a Green Business Task Force. The Task Force meets regularly and is providing information and profiles of leading businesses in San Carlos in their newsletter. The Chamber also has held two community-wide eWaste events in San Carlos. The Chamber also aids the City in identifying local firms to participate in the Bay Area Green Business Certification Program and has held two of their Pulse of Business monthly programs on adding green practices to your company as well as a recent Green Briefing and Trade Show at the San Carlos Library for businesses in San Carlos and throughout Northern San Mateo County.

Resident Programs and San Carlos Green

San Carlos residents are a key part of efforts to work on Green Programs and Climate Protection in San Carlos. Community volunteers with San Carlos Green have spearheaded a number of efforts, including the Solar City Discount Solar Program, Yahoo Greenest City contest, weeding and replanting of Vista Park with California natives, and distribution of energy and water efficiency fixtures and educational materials at community events.

Countywide and Regional Efforts

Recognizing the size and scope of the challenge, the City of San Carlos was a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative. Today that effort has grown to include all 42 cities and counties in Silicon Valley. The City has also joined and participated in several related efforts including work by ICLEI, the Bay Area Air Quality Management District, the Association of Bay Area Governments (ABAG), the Institute of Local Self Government (ILSG) and the League of California Cities.

Video Presentations - Green Programs and Climate Protection

The City Staff brings reports on the City's work in the areas of Green Programs and Climate Protection to the City Council on a periodic basis including reports to the City Council, the Solar City Community Solar Discount Program (June - August 2007) and recognition of the San Carlos businesses that have earned a Green Certification in the Bay Area Green Business Program. A recent report to the City Council in May celebrated the program's 1 Year Anniversary and highlighted plans for the coming year.

Community Greenhouse Gas Emissions in 2005
City of San Carlos Community Inventory
Detailed Report

	Equiv CO₂ (tonnes)	Equiv CO₂ (%)	Energy (MMBtu)
<u>RESIDENTIAL</u>			
San Carlos, CA			
<i>PG&E Electricity - Non Govt - 2005</i>			
Electricity	16,320	7.1	249,152
Natural Gas	32,858	14.2	617,574
<i>Subtotal PG&E Electricity - Non Govt - 2005</i>	49,178	21.3	866,726
Subtotal Residential	49,178	21.3	866,726

Data Sources:

1. Electricity and natural gas data provided by PG&E: Xantha Bruso, XxB1@pge.com, (415) 973-2514.

Notes:

1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO₂ emission factor of 0.492859 lbs/kWh of delivered electricity. This emissions factor is certified by the California Climate Action Registry and was reported to ICLEI in January 2007 by Greg San Martin. Criteria air pollutant emission factors for electricity are derived from the NERC Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set.
2. The "California Coefficients for Natural Gas" coefficient set is based on a PG&E eCO₂ emissions factor of 53.05 kg/MMBtu of delivered natural gas, certified by the California Climate Action Registry and the CEC, and was reported to ICLEI in Dec 2007 by Jasmin Ansar. Criteria air pollutant emissions factors for natural gas are derived from the US EPA's annual report of air pollution emission trends (USEPA, 2001c).

COMMERCIAL / INDUSTRIAL

San Carlos, CA			
<i>Industrial Direct Access Electricity</i>			
Electricity	8,292	3.6	87,922
<i>Subtotal Industrial Direct Access Electricity</i>	8,292	3.6	87,922
<i>Total Commercial Nongovernmental</i>			
Electricity	27,168	11.8	414,770
Natural Gas	16,363	7.1	307,554
<i>Subtotal Total Commercial Non-gov</i>	43,532	18.8	722,324
<i>Total Non-Commercial - City</i>			
Electricity	654	0.3	9,979
Natural Gas	348	0.2	6,540
<i>Subtotal Total Non-Commercial - City</i>	1,002	0.4	16,519
<i>Total Non-Commercial - District</i>			
Electricity	954	0.4	14,562
Natural Gas	441	0.2	8,296
<i>Subtotal Total Non-Commercial - District</i>	1,395	0.6	22,857
<i>Total Noncommercial - County</i>			
Electricity	284	0.1	4,339
Natural Gas	114	0.0	2,141
<i>Subtotal Total Noncommercial - County</i>	398	0.2	6,480
Subtotal Commercial	54,619	23.6	856,101

Data Sources:

Community Greenhouse Gas Emissions in 2005

City of San Carlos Community Inventory

Detailed Report

Equiv CO ₂ (tonnes)	Equiv CO ₂ (%)	Energy (MMBtu)
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1. Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814 ph 916.654.4928 fax 916.654.4901 email agough@energy.state.ca.us

Notes:

1. The commercial and industrial sectors are combined as a result of the 15/15 rule. The 15/15 rule was adopted by the CPUC in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality.
2. Direct Access Electricity is electricity not generated by PG&E yet delivered to an industrial customer through PG&E lines.
3. Estimations of electricity purchased through Direct Access (DA) contracts at the county level based on data provided by the California Energy Commission. The amount of DA in a given community varies. 19.82% of non-residential electricity consumption in San Mateo County was DA in 2005 according to the CEC.
4. The Average Grid Electricity Set is unknown for Direct Access Electricity because the power was not generated by PG&E, therefore Set 13 - Western Systems Coordinating Council - was used as the best available estimation.
5. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO₂ emission factor of 0.492859 lbs/kWh of delivered electricity. This emissions factor is certified by the California Climate Action Registry and was reported to ICLEI in January 2007 by Greg San Martin. Criteria air pollutant emission factors for electricity are derived from the NERC Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set.
6. The "California Coefficients for Natural Gas" coefficient set is based on a PG&E eCO₂ emissions factor of 53.05 kg/MMBtu of delivered natural gas, certified by the California Climate Action Registry and the CEC, and was reported to ICLEI in Dec 2007 by Jasmin Ansar. Criteria air pollutant emissions factors for natural gas are derived from the US EPA's annual report of air pollution emission trends (USEPA, 2001c).

TRANSPORTATION**San Carlos, CA*****State Highway Vehicle Miles Traveled (VMT)***

Gasoline	55,844	24.2	774,350
Diesel	5,103	2.2	60,172
Subtotal State Highway VMT	60,947	26.4	834,522

Total Community On-Road Vehicle Miles Traveled (VMT)

Gasoline	48,411	21.0	671,252
Diesel	4,424	1.9	52,161
Subtotal Total Community VMT	52,834	22.9	723,413

CalTrain Weekday Commuters

Diesel	702	0.3	8,386
Subtotal CalTrain Weekday Commuters	702	0.3	8,386

Subtotal Transportation	114,483	49.5	1,566,320
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Highway and On-Road Data Sources:

1. Local Roads Vehicle Miles Traveled (VMT) 2005 data provided by Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC) hbrasil@mtc.ca.gov, (510) 817-5747. Data analyzed by Micah Lang, Sr. Program Officer, ICLEI.
2. State Highways Vehicle Miles Traveled (VMT) 2005 data provided by CalTrans, analyzed by Micah Lang, Sr. Program Officer, ICLEI and Theresa Krebs, Program Officer, ICLEI. <http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf>. Data Source File from ICLEI: SanMateo_SantaClara_HighwayVMT_MarchUpdate_v workshop.xls
3. EMFAC data provided in November, 2007 by Amir Fanai, Principal Air Quality Engineer, Bay Area Air Quality Management District, AFanai@baaqmd.gov.

Highway and On-Road Notes:

1. Local Road VMT data provided by MTC is in Daily VMT (DVMT); Annual VMT = DVMT x 365 x 1000. State highway VMT provided in DVMT. VMT = DVMT x 365.
2. The VMT by fuel and vehicle type is calculated using San Mateo County VMT % (by vehicle type) and the CACP fleet breakdown by fuel type provided by EMFAC.

Community Greenhouse Gas Emissions in 2005

City of San Carlos Community Inventory

Detailed Report

Equiv CO ₂ (tonnes)	Equiv CO ₂ (%)	Energy (MMBtu)
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---CALTRAIN ANALYSIS---

Data Sources:

1. CalTrain Ridership data came from the "2005 CalTrain Ridership Report," http://www.caltrain.com/pdf/annual_ridership_counts/2005_Caltrain_Ridership_Counts.pdf
2. CalTrain fuel usage and capacity data came from "Annual Operating and Capital Budget FY 2004-2005" <http://www.caltrain.com/pdf/Budget/FY2005.pdf>
3. Data calculations modified from calculations performed in the City of Menlo Park Community Greenhouse Gas Emissions Analysis, 2005.
4. Data calculated and entered on Sept 23, 2008 by Jillian Rich, PMC, jrich@pmcworld.com, (510) 272-4491.

Calculation:

- Number of Riders going southbound from San Carlos during the AM peak hours in Feb 2005: 202
- Number of Riders going southbound from San Carlos during the AM peak hours in Feb 2005: 160
- Average total 2005 weekday ridership in San Carlos: 836
- Roundtrip distance from San Carlos caltrain to San Francisco caltrain: 24 miles (estimate)
- Roundtrip distance from San Carlos caltrain to San Jose caltrain: 25 miles (estimate)
 - > Total daily passenger miles traveled from San Carlos northbound: 11,208
 - > Total daily passenger miles traveled from San Carlos southbound: 9,225
 - > Therefore the total daily passenger miles traveled that San Carlos residents are responsible for is 20,433 (This is an estimate based on the ratio of riders going northbound versus southbound and assuming that all commuters are either going to San Jose or San Francisco).
- Overall, trains run at 38.1% of their capacity
- The average number of passenger cars per train is 4.7
- The average car capacity is 135 people.
- The average capacity for a train is 634.5 people

$634.6 \times 38.1\% = 242$ people are on each train on average

- On average, CalTrain engines use 3.13 gallons of diesel per mile traveled

CalTrain Fuel efficiency = $(1 \text{ mile} / 3.13 \text{ gallons}) \times (242 \text{ passengers}) = 77.3 \text{ passenger miles} / \text{gallon}$

The number of gallons of diesel that San Carlos weekday commuters are responsible for:

$(20,433 \text{ passenger miles/weekday}) \times (1 \text{ gallon} / 77.3 \text{ passenger miles}) = (264.33 \text{ gallons} / \text{weekday}) \times (260 \text{ Working days} / \text{year}) = 68,726.78 \text{ gallons of diesel per year from weekdays, not taking into consideration holidays.}$

WASTE

Total Solid Waste Landfill Tonnage

Paper Products	7,228	3.1
Food Waste	2,395	1.0
Plant Debris	1,052	0.5
Wood/Textiles	1,916	0.8
Subtotal Total Solid Waste Landfill Tonnage	12,590	5.4

Disposal Method - Managed Landfill

San Carlos, CA

Total Alternative Daily Cover (ADC)

Plant Debris	187	0.1
Subtotal Total Alternative Daily Cover (ADC)	187	0.1

Disposal Method - Managed Landfill

Subtotal Waste	12,777	5.5
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Data Sources:

1. Community waste tonnage, ADC tonnage, and ADC waste share by type is from the California Integrated Waste Management Board San Carlos profile: <http://www.ciwmb.ca.gov/LGCentral/DRS/Reports/JurDspFa.asp>
2. Percentages of waste share by type for Total Landfill Tonnage provided by the California Integrated Waste Management Board (CIWMB) Waste Characterization Report (2004) <http://www.ciwmb.ca.gov/publications/default.asp?pubid=1097>

Community Greenhouse Gas Emissions in 2005
City of San Carlos Community Inventory
Detailed Report

Equiv CO ₂ (tonnes)	Equiv CO ₂ (%)	Energy (MMBtu)
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Notes:

1. 60% methane recovery factor is derived from EPA AP 42 emissions factor guidelines: <http://www.epa.gov/ttn/chief/ap42>
2. Recycling and compost tonnage has been omitted from this analysis.
3. Alternative Daily Cover (ADC) is "cover material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging" (California Integrated Waste Management Board).
4. The Ox Mountain Sanitary Landfill used 809 Tons of plant material as ADC while the Potrero Hills Landfill uses Construction and Demolition debris. Plant material has a small emissions coefficient, therefore resulting in 187 tonnes eCO₂ from Ox Mountain and 0 (zero) tonnes eCO₂ from Potrero Hills Landfill.

Total	231,057	100.0	3,289,147
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Appendix D

Summary of Updates

Sector	Emission Source	Former Output Data CO ₂ e (metric tons/year)	Updated Output Data CO ₂ e (metric tons/year)	Description of Update
Residential	Electricity Consumption	16,320	16,320	No change.
	Natural Gas Consumption	32,858	32,858	
	<i>Subtotal</i>	49,178	49,178	
Commercial (Industrial)	Electricity Consumption	29,060	37,352	In the former version, industrial natural gas and PG&E electricity were included in the commercial outputs, yet Industrial Direct Access Electricity was in an “industrial” category. In this version, all industrial energy was put into the commercial sector for clarity and consistency.
	Natural Gas Consumption	17,267	17,267	
	<i>Subtotal</i>	46,327	54,619	
Industrial	Electricity Consumption	8,293	--	Industrial Direct Access Electricity was combined with Commercial electricity for consistency.
	Natural Gas Consumption	--	--	
		8,239	--	
Transportation	Highway Gasoline and Diesel Consumption (VMT)	60,951	60,947	The transportation sector was updated with an estimate of CalTrain diesel consumption from San Carlos weekday commuters. See Appendix C for the methodology used. CO ₂ e levels for highway and community on-road travel changed slightly with new emissions coefficients from ICLEI.
	City Roadway Gasoline and Diesel Consumption (VMT)	52,833	52,834	
	CalTrain Diesel consumption for San Carlos commuters	--	702	
	<i>Subtotal</i>	113,785	114,483	
Waste	Lifetime Decomposition of Waste Generated	11,422	12,590	While the 2005 tonnage of waste remains the same, the methane capture, CO ₂ e coefficients, and methodology changed between the original and updated inventory.
	Lifetime Decomposition of Alternative Daily Cover	188	187	
	<i>Subtotal</i>	11,610	12,777	
Total		229,193	231,057	

Appendix D: Reduction Measure Selection Process

In this appendix:

D1: List of 125 reduction measures considered at the Sept. 16, 2008 CAP Subcommittee meeting

D2: List and description of 31 reduction measures chosen for community consideration by the Subcommittee *

D3: Final list of 24 reduction measures chosen by the subcommittee and community for inclusion in the CAP**

* These reduction measures are referred to as "goals" in the Climate Action Plan

** Some of the 24 reduction measures were combined for clarity in this draft Climate Action Plan

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Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

The purpose of this list is to inform the San Carlos CAP Subcommittee's efforts to propose 40-60 emission reduction measures for use at the September 25, 2008 public meeting. The eventual goal is to arrive at 24 reduction measures that can be used to develop or support programs to reduce the City's government and community emissions. Following ranking of preference, the 24 most preferred measures will be analyzed to determine the amount of CO2e reduced per unit of cost. This spreadsheet includes emission reduction measures and includes adaptation measures that won't reduce emissions, but will support the City's development of emission reduction strategies.

Sub-Category		Strategy	Ca Attorney General	Alameda	Aliso Viejo/Clairemont	Berkeley	Marin	Palo Alto	San Diego	San Francisco	San Mateo	Sonoma
			25% below 2005 by 2020	Various reduction targets	33% below 2000 by 2020	15% below 2000 by 2020	15% below 2000 by 2020	15% below 2005 by 2020	20% below 1990 by 2010	1990 levels by 2012	20% below 2000 by 2020	
Energy Use												
Green Building / Energy efficient building design	1	<i>Site buildings to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.</i>	x								x	
	2	<i>Install efficient lighting and lighting control systems. Use daylight as an integral part of lighting systems in buildings.</i>	x							x		
	3	Adopt a Green Building Standard for new development. Apply LEED standard for a large-scale commercial buildings and Build it Green (BIG) standards for smaller scale residential properties. Provide additional training for zoning and building permit plan-checkers to enable them to become more familiar with the industry's latest green building techniques.		x	x	x				x		
	4	Consider establishing energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards applied to the City's climate zone.			x							
	5	Develop a wood-burning prohibition ordinance to reduce air pollution for new residential construction	x									
	6	Require light colored, high albedo (white content) rooftops and pavement to prevent the heat-island effect and lower air conditioning use.			x						x	
	7	Identify and develop financial incentives, low-cost financing tools, and targeted tax rebates to enable increased green building in the private sector.			x			x		x		
Enhance energy services and standards for existing residential properties.	8	Expand and better integrate programs for low-income households such as the distribution of CFL lights and water-conserving showerheads.			x				x	x		
	9	Update or create a Residential Energy Conservation Ordinance (RECO) and consider using RECO to establish home energy ratings.			x							
	10	Perform energy-efficient lighting retrofits and/or home energy audits. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	x		x	x					x	
	11	Identify opportunities for energy savings in renter-occupied buildings.			x							
Enhance energy services and	12	<i>Install energy efficient heating and cooling systems, appliances, and equipment, and control systems.</i>	x									
	13	Reward businesses that develop and implement energy conservation programs including energy efficiency improvements and fuel switching (including use of solar energy), heat recovery/co-generation systems.									x	

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

			<i>Ca Attorney General</i>	<i>Alameda</i> 25% below 2005 by 2020	<i>Aliso Viejo/Claremont</i> Various reduction targets	<i>Berkeley</i> 33% below 2000 by 2020	<i>Marin</i> 15% below 2000 by 2020	<i>Palo Alto</i> 15% below 2005 by 2020	<i>San Diego</i> 15% below 1990 by 2010	<i>San Francisco</i> 20% below 1990 by 2012	<i>San Mateo</i> 1990 levels by 2020	<i>Sonoma</i> 20% below 2000 by 2020
Sub-Category		Strategy										
standards for existing commercial properties.	14	Review and update the City's Commercial Energy Conservation Ordinance.				x						
	15	Identify voluntary opportunities to implement energy improvements at the time of sale.				x						
	16	Expand energy saving opportunities designed specifically for small businesses.				x						x
	17	Expand energy saving opportunities for large commercial and industrial properties										
Increase use of energy-efficiency in city-run buildings and services	18	<i>Install LED lights for traffic signals, street lights, and other outdoor lighting.</i>	x			x						
	19	<i>Limit the hours of operation of outdoor lighting.</i>	x									
Establish Financing Programs to Support Emission Reduction Strategies	20	Develop a tax rebate program for efficiency improvements in businesses.										x
	21	Establish financing programs for efficiency improvements in the community, for example, revolving loan funds through bonds, taxes, etc.										

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

Sub-Category			Strategy		Ca Attorney General	Alameda	Aliso Viejo/Claremont	Berkeley	Marin	Palo Alto	San Diego	San Francisco	San Mateo	Sonoma
					25% below 2005 by 2020	Various reduction targets	33% below 2000 by 2020	15% below 2000 by 2020	15% below 2000 by 2020	15% below 2005 by 2020	20% below 1990 by 2010	1990 levels by 2012	20% below 2000 by 2020	
Increase renewable energy use.	22	Identify opportunities for increasing solar system installations, wind energy generation, solar and tankless hot water heaters, energy efficient ventilation and air conditioning. Research biomass energy opportunities.			x									
	23	<i>Install solar panels on carports and over parking areas.</i> This could be required by the City in new large-scale residential and commercial projects.	x											
	24	<i>Use combined heat and power in appropriate applications.</i>												
Support and develop green power purchasing	25	Support legislation to allow the City to be compensated for exported solar power.									x			
Solid Waste														
Increase commercial recycling, composting, and waste reduction	26	Continue and enhance cooperative outreach efforts with StopWaste.Org and other entities to encourage increased participation in existing recycling/composting programs				x					x			
	27	Facilitate connections between food rescue organizations and Palo Alto businesses to reduce the amount of food discarded into the waste stream.				x			x					
	28	Consider a ban on polystyrene foam to-go containers		x										
	29	Expand efforts to work with local businesses to reduce the use of disposable items such as plastic bags and take-out containers.		x		x			x					
Implement a "Zero Waste" policy	30	For municipal operations, establish a Zero Waste policy. Everything would be recycled, no or minimal disposables would be allowed, and composting would be required.		x					x					
Establish waste reduction policies for construction and demolition of buildings	31	Design and implement more effective "space allocation ordinances" to ensure that new and remodeled commercial buildings provide adequate space for storage of recycling materials, i.e., refuse enclosure areas to accommodate recycling and composting bins and a convenient recycling system for building occupants.							x		x			
	32	Establish a construction waste reduction ordinance to reuse and recycle construction and demolition waste.	x	x		x	x	x			x			
Increase residential recycling and composting	33	Target expanded recycling outreach and services to multi-family residential buildings, including apartment buildings, fraternities and sororities, and cooperative housing.				x			x		x			
	34	Ensure that new waste collection and processing service RFP includes Zero Waste service options (e.g., expanded organics collection, expanded C & D debris collection and container inspections upon collection).							x					

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

		<i>Ca Attorney General</i>	<i>Alameda</i> 25% below 2005 by 2020	<i>Aliso Viejo/Claremont</i> Various reduction targets	<i>Berkeley</i> 33% below 2000 by 2020	<i>Marin</i> 15% below 2000 by 2020	<i>Palo Alto</i> 15% below 2005 by 2020	<i>San Diego</i> 15% below 1990 by 2010	<i>San Francisco</i> 20% below 1990 by 2012	<i>San Mateo</i> 1990 levels by 2020	<i>Sonoma</i> 20% below 2000 by 2020
Sub-Category	Strategy										
	35 Enforce residential recycling and fine residents and landlords for not recycling or recycling incorrectly, including composting garden waste.							x			
Mandate recycling and green waste programs at large events, in public areas, and for city buildings	36 <i>Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers located in public areas.</i>	x				x		x			
	37 Support development of a Sustainable Purchasing Policy and Implementation Plan										
	38 Make recycling mandatory at public events.			x		x					
Increase landfill and wastewater treatment efficiency	39 <i>Recover by-product methane to generate electricity.</i>	x									
	40 Propose materials to be banned from landfills in the city					x					
	41 <i>Install an anaerobic digester at wastewater treatment facilities.</i>	x			x						
Support alternate collection methods for recyclable materials	42 Increase metals recycling.							x			
	43 Find a location for a local recycling drop-off center and household hazardous waste facility. Support community drop-off, buy-back, and collection			x		x					

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

Sub-Category		Strategy	Ca Attorney General	Alameda 25% below 2005 by 2020	Aliso Viejo/Claremont Various reduction targets	Berkeley 33% below 2000 by 2020	Marin 15% below 2000 by 2020	Palo Alto 15% below 2005 by 2020	San Diego 15% below 1990 by 2010	San Francisco 20% below 1990 by 2012	San Mateo 1990 levels by 2020	Sonoma 20% below 2000 by 2020
Extend producer responsibility for product waste	44	Support policies at other levels of government that place the responsibility for product waste on the brand owner or manufacturer.			x		x					
product waste	45	Enhance outreach and education to local businesses about the waste embodied in products and packaging and create incentives.			x							
Transportation and Land Use												
Encourage mixed-use, high density, infill development to reduce vehicle trips	46	<i>Include mixed-use, infill, and higher density in development projects to support the reduction of vehicle trips, promote alternatives to individual vehicle travel, and promote efficient delivery of services and goods.</i>	x		x	x	x			x	x	
	47	<i>Develop "brownfields" and other unused or defunct properties near existing public transportation and jobs.</i>	x									
	48	Create a work/live ordinance to provide great opportunities for reduced work-related commutes				x					x	
	49	Provide for a mixture of complementary retail uses to be located together to create activity nodes and serve adjacent neighborhoods and to draw visitors from other neighborhoods and from outside the area (e.g. sports facilities).			x							
	50	Increasing housing density near transit (transit overlay zone or transit oriented development)		x	x	x	x			x	x	
Provide for convenient and safe local travel	51	Maintain a high level of connectivity of the roadway network. Minimize cul-de-sacs and incomplete roadway segments.			x							
	52	Apply creative traffic management approaches to address congestion in areas with unique problems, particularly on roadways and intersections in the vicinity of schools in the morning and afternoon peak hours, and near churches, parks and community centers.			x							
	53	Work with adjacent jurisdictions to address the impacts of regional development patterns (e.g. residential development in surrounding communities, regional universities, employment centers, and commercial developments) on the circulation system.			x							
Incorporate non-vehicular modes of transportation into project design	54	<i>Incorporate public transit into project design</i>			x		x					
	55	<i>Incorporate bicycle lanes and routes into street systems, new subdivisions, and large developments.</i>			x		x					
	56	Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, or walking.	x		x							
	57	Encourage local employers to hire locally in order to reduce the distance those employed in the city have to travel.				x						

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

		Strategy										
Sub-Category			<i>Ca Attorney General</i>	<i>Alameda</i> 25% below 2005 by 2020	<i>Aliso Viejo/Claremont</i> Various reduction targets	<i>Berkeley</i> 33% below 2000 by 2020	<i>Marin</i> 15% below 2000 by 2020	<i>Palo Alto</i> 15% below 2005 by 2020	<i>San Diego</i> 15% below 1990 by 2010	<i>San Francisco</i> 20% below 1990 by 2012	<i>San Mateo</i> 1990 levels by 2020	<i>Sonoma</i> 20% below 2000 by 2020
Promote land use policies that reduce personal vehicle travel	58	Revise minimum/appropriate parking requirements, including shared parking and disincentives for single-occupant autos.										
	59	Consider reducing or eliminating on-site parking requirements and adjusting parking pricing.			x		x					
	60	Require transportation demand management (TDM) programs and develop monitoring programs to track effectiveness	x				x					
	61	Pedestrian-oriented street design, including direct, short, convenient linkages.			x							
Preserve and create open space and parks	62	Expand "green" park design and sustainable maintenance practices.										
	63	Coordinate with local and regional plant experts in selecting tree species that respect the natural region in which San Carlos is located, to help create a healthier, more sustainable urban forest.			x							
	64	Require the planting of street trees along streets and inclusion of trees and landscaping for all development projects to help improve airshed and minimize urban heat island effects. Identify a specific percentage goal to achieve within 5 yrs.			x							
	65	<i>Preserve and create open space and parks. Preserve existing trees, and plant replacement trees at a set ratio.</i>	x									

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

Sub-Category		Strategy		Ca Attorney General	Alameda 25% below 2005 by 2020	Aliso Viejo/Claremont Various reduction targets	Berkeley 33% below 2000 by 2020	Marin 15% below 2000 by 2020	Palo Alto 15% below 2000 by 2020	San Diego 15% below 2005 by 2020	San Francisco 20% below 1990 by 2010	San Mateo 1990 levels by 2012	Sonoma 20% below 2000 by 2020
Increase car sharing and ridesharing opportunities as an alternative to single-occupancy driving.	66	<i>Promote ride sharing programs.</i>	x	x	x		x			x			
	67	<i>Create car sharing programs. Accommodations for such programs include providing parking spaces for the car share vehicles at convenient locations accessible by public transportation.</i>	x	x			x	x					
	68	<i>Promote "least polluting" ways to connect people and goods to their destinations.</i>	x										
	69	Consider providing incentives or requiring that developers of new residential and commercial projects make spaces available for car share vehicles.				x							
Support trip reduction through employer-based programs	70	Provide bike parking and shower facilities		x									
	71	Create parking disincentives for single occupancy vehicles or provide parking cash-out programs.						x					
	72	Offer to enroll nearby employers in carpool match-up programs. Give preferential parking to carpooling vehicles.						x				x	
	73	Consider alternative work hours (e.g. four-day work week or 10-7 to reduce rush hour traffic)		x								x	
	74	<i>Limit idling time for commercial vehicles, including delivery and construction vehicles.</i>	x					x					
	75	<i>Institute a telecommute work program. Provide information, training, and incentives to encourage participation. Provide incentives for equipment purchases to allow high-quality teleconferences.</i>	x			x	x		x				
Encourage more fuel-efficient vehicles, electric vehicles, and other alternatively-fueled vehicles.	76	<i>Use low or zero-emission vehicles, including construction vehicles.</i>	x										
	77	<i>Provide the necessary facilities and infrastructure to encourage the use of low or zero-emission vehicles.</i>	x			x							
	78	Convert more City vehicles to hybrid, electric, and alternative fuel vehicles.		x	x				x				
	79	Develop a program to reduce the use of 2-cycle combustion engines, including the enforcement of existing ordinances. Encourage the establishment of trade-in programs.		x									
	80	Offer prioritized parking for hybrid or alternative fuel cars.					x	x			x	x	
	81	Promote local bio-diesel market development.		x		x		x					
Discourage personal vehicle trips	82	Implement tiered vehicle registration fees based on vehicle size or emissions.						x					
	83	Price parking in the downtown and other commercial areas to discourage moving of vehicles between parking facilities (e.g. initial hour(s) more expensive than subsequent time when parked).									x		

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

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Sub-Category		Strategy										
Improve the bicycle and pedestrian environment in the City.	84	<i>Incorporate bicycle-friendly intersections into street design.</i>	x	x	x	x	x			x		
	85	<i>For commercial projects, provide adequate bicycle parking near building entrances to promote cyclist safety, security, and convenience. For large employers, provide facilities that encourage bicycle commuting, including, e.g., locked bicycle storage or covered or indoor bicycle parking.</i>	x	x		x		x		x	x	
	86	Guarantee emergency rides home for pedestrians and bicyclists.										x
	87	Provide ADA accessible sidewalks and paths.										
	88	Provide safe and convenient pedestrian and bicycle connections to and from town centers, other commercial districts, office complexes, neighborhoods, school and other major activity centers, and surrounding communities.			x							
	89	Encourage businesses or residents to sponsor street furniture and landscaped areas.			x							
	90	Provide for an education program and stepped up code enforcement to address and minimize vegetation that degrades access along public rights- of way.			x							
	91	Actively promote walking as a safe mode of local travel, particularly for children attending local schools - employ traffic calming methods such as median landscaping and provisions of bike or transit to slow traffic, improve roadway capacity, and address safety issues.			x							
	92	Partner with Cal train and other transit providers to improve bicycle access on trains and at stations.			x	x				x		
	93	<i>Create bicycle lanes and walking paths directed to the location of schools, parks, and other destination points.</i>	x			x				x		
Make public transit more	94	<i>Provide public transit incentives such as free or low-cost monthly transit passes.</i>	x		x	x						x
	95	<i>Provide shuttle service to public transit.</i>	x	x								x
	96	<i>Work with the school district to restore or expand school bus service.</i>	x		x		x					
	97	Expand local or regional bus service in range and/or frequency.			x		x			x		
	98	Work to provide a strong paratransit system that promotes the mobility of all residents and educate residents about local mobility choices.			x							
	99	Encourage convenient public transit service between San Carlos and airports. Work with Caltrain and BART.			x							
	100	Coordinate the different modes of travel to enable users to transfer easily from one mode to another.			x							

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

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Sub-Category	Strategy										
convenient and accessible.	101 Enhance and encourage provision of attractive and appropriate transit amenities, including shaded bus stops, to encourage use of public transportation.			x							
	102 Create an alternative transportation funding priority list for the City's Capital improvement Program. The list should include project costs and funding sources.		x								
	103 Establish a service center for transit passes, route information, schedules, maps, car and van pool information and coordination.										
	104 Investigate the potential for real-time transit signage for bus lines.				x						
	105 Support regional efforts to implement improved bus service, including consideration of bus rapid transit (BRT).				x						

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

Sub-Category		Strategy	Ca Attorney General	Alameda	Aliso Viejo/Claremont	Berkeley	Marin	Palo Alto	San Diego	San Francisco	San Mateo	Sonoma
25% below 2005 by 2020 Various reduction targets 33% below 2000 by 2020 15% below 2000 by 2020 15% below 2005 by 2020 15% below 1990 by 2010 20% below 1990 by 2012 20% below 2000 by 2020												
Water Resources (As the supply of drinkable water decreases, our use of energy to filter and move that water increases. Therefore, this is not only an adaptation measure for a limited natural resource affected by climate change, but a reduction measure for energy use as well)												
Conserve water through building and site design	106	Create water-efficient landscapes.	x									
	107	Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls.	x									
	108	Design buildings to be water-efficient. Install water-efficient fixtures and appliances.	x									
	109	Implement low-impact development practices to manage storm water and protect the environment.	x									
Increase or establish use of reclaimed/gray water	110	Use reclaimed water for landscape irrigation in new developments and on public property. Install the infrastructure to deliver and use reclaimed water.	x									
	111	Use graywater (untreated household waste water). For example, install dual plumbing in all new development allowing graywater to be used for landscape irrigation.	x									
Protect water resources and ensure flood protection	112	Continuously protect the ecological integrity of the City's primary drinking water source.										
	113	Work to provide exceptional flood protection.										
	114	Implement the Statewide Urban Water Conservation Council's water conservation best management practices.										
Create water conservation policy and enforcement	115	Restrict watering methods and control runoff.	x									
	116	Restrict the use of water for cleaning outdoor surfaces and vehicles.	x									
	117	Provide education about water conservation and available programs and incentives.	x									
Community Outreach and Education												
Incorporate Public education into each GHG reduction strategy	118	Provide education on energy efficiency	x	x	x							
	119	Provide education about water conservation and available programs and incentives	x			x						
	120	Provide education and publicity about reducing waste and available recycling services	x									
	121	Educate the public about the benefits of well-designed, higher density development	x									
	122	Sustain outreach to single-family homes regarding curbside recyclables and organic waste collection.				x	x		x			

Climate Action Plan Reduction and Adaptation Strategies for Consideration by the City of San Carlos

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123	<i>Provide information on all options for individuals and businesses to reduce transportation-related emission. Provide education and information about public transportation.</i>	x									
Create a personal pledge for community member to sign along with strategies for them to decrease their personal carbon footprint	124 Make a San Carlos "My Very Own Climate Action Plan" appendix that includes easy, intermediate, and advances options for community members to attain their reduction goal.				x						
Require that all recommended City Council actions include an analysis or evaluation of whether the action supports or is consistent with the reduction goals of the City.	125 Mandate that every staff report about a Council action include a "Climate Change Analysis" much like the "fiscal analysis" that is already included.		x								

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
Energy Use			
1	(1) Site Buildings to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.	Incorporate consideration of shade, prevailing winds, sustainable landscaping, and sun screening into building permit approvals. The California Attorney General recommends this measure.	These are natural, low-cost methods of reducing the urban heat island effect and lowering cooling costs for building owners. Some costs would be incurred to the City to address these issues in municipal codes, educate Staff, and enforce the issues. If the Green Building standard strategy (below) is chosen, this reduction measure will be unnecessary as Green Building requires sustainable siting.
2	(3) Adopt a Green Building Standard for all new development and major remodels. Apply a high LEED standard (silver or gold) for large-scale commercial buildings and Build it Green (BIG) standards for residential properties. Consider a lower certification (ex: LEED certified) for smaller scale commercial buildings. Provide additional training for zoning and building permit plan-checkers to enable them to become more familiar with the industry's latest green building techniques.	Green building standards certify and give guidance on how to make a building more efficient and reduce its effect on human health through better siting, design, construction, maintenance, and operation. The requirements would be based on building square footage for new development and on remodel cost for existing development. The Cities of Alameda, Berkeley, Marin, and San Mateo recommend a green building ordinance in their Climate Action Plans (CAPs).	This requirement would significantly lower the GHG emissions from new construction and eventually lead to decreased emissions from the commercial and residential sectors, which today create 41% of San Carlos' emissions. There would be increased costs to developers and a need for more Staff time.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
3 (4)	Consider establishing energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards applied to the City's climate zone.	All new construction and additions have been required to meet minimum energy efficiency standards since 1978. The State of California is currently updating its Title 24 requirements for 2009. The City would consider establishing standards exceeding the State's standards at that time. For more information on Title 24 see http://www.energy.ca.gov/title24/ . The City of Berkeley recommends a similar measure in their draft CAP.	Benefits cannot be determined until the new requirements are released in 2009. However, electricity use is the cause of 23% of San Carlos' GHG emissions, so these standards could significantly reduce emissions. Costs would be staff time for writing the requirements into the Building Code and potential increased costs to developers and homeowners at the onset of construction.
4 (8)	Expand and better integrate programs that increase energy efficiency in low-income households.	Expand free services to low-income households, including: energy efficient appliances, window repair/replacement, water conserving showerheads, water heater blankets, energy saving light bulbs, attic insulation, and more. The Cities of Berkeley, San Francisco, and San Mateo have a similar measure in their CAPs.	It is important to protect all residents from climate change equally. There are numerous funding sources for programs such as these, including federal grants, the State of California Low-Income Energy Efficiency (LIEE) Program, and PG&E's Energy Partners Program.
5 (10)	Perform energy-efficient lighting retrofits and/or home energy audits. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	Encourage residents to perform home energy audits and to follow up on implementation of the recommendations of the audit. The California Attorney General recommends home energy audits as a reduction measure.	This would be a way to reach out to homes built before the Title 24 standards came into effect in 1978. The program could benefit from partnerships with citizen-run organizations, PG&E, and auditors. Cost associated with Staff time for implementing, monitoring, and advertising the program.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
6 (16)	Expand energy saving opportunities designed specifically for small businesses.	It is especially difficult for small businesses to find the time or money to become energy efficient. This program would increase outreach to small businesses (less than 20 employees) and educate them about ways in which energy can be saved through lighting modifications, refrigeration, etc. The City of Berkeley draft CAP includes a similar measure.	Energy saving opportunities for small businesses could increase their revenue and decrease the City's GHG emissions. Cost associated with outreach and Staff time. Possible partnerships with PG&E or the Public Utilities Commission.
7 (17)	Expand energy saving opportunities for large commercial and industrial properties.	Large commercial and industrial businesses are already feeling the burden of increased fuel and electricity costs. PG&E and RecycleWorks.org already have services and/or staff to help these businesses, but it would be beneficial to have a City staff person to make sure businesses are up-to-date and aware of current services, information, and rebates.	There would be increased Staff time, but since the programs are run by other organizations there would be minimal additional costs.
8 (20)	Develop a tax rebate program for efficiency improvements in businesses.	Tax rebates would be offered upon completion of a major energy-saving improvement in order to lessen the monetary impact these improvements have on businesses at the onset. The Sonoma County CAP recommends a similar measure.	San Carlos' businesses create 20% of the City's GHG emissions. This rebate program would act as an incentive for more businesses to become energy efficient by decreasing their energy use and our emissions. It would result in decreased revenue to the City, however if a cap was created capping how many businesses were eligible to apply per year, the impact could be minimized and would result in a competitive process promoting timely efficiency improvements.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
9 (22)	Identify opportunities for increasing solar system installations, wind energy generation, solar and tankless hot water heaters, energy efficient ventilation and air conditioning. Research biomass energy opportunities.	Research and identify opportunities for incorporating these devices into municipal code language, installing them in City-owned facilities, and educating businesses about their benefits. Use state programs to encourage alternative energy and net-metering to provide additional emissions reductions. The California Attorney General recommends a similar measure.	These methods for decreasing GHG emissions are effective, yet not commonly used. Using them would establish San Carlos as a progressive, technologically aware city on the topic of climate change.
10 (19)	Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	The City is currently working on auditing the energy performance of City owned and operated facilities. This measure is to implement the recommendations included in the audit to increase efficiency in these buildings. This measure was largely derived at the 9/16 meeting.	The energy-saving measures will save the City money on electricity while lowering its GHG emissions. It will also establish the City as an example for privately-owned facilities to follow.
11 (106)	Create water- and waste-efficient landscapes.	Efficient landscaping, also known as xeriscaping, reduces the amount of resources needed to maintain it by using native plants and efficient irrigation systems. These technologies could be used in City park renovations and encouraged in residential and commercial development. The Attorney General recommends water-efficient landscapes.	This measure saves water and thus the energy used for water filtration and movement. It also lowers the amount of yard waste sent to landfills and reduces demand on our supply of fresh water, which largely comes from the Hetch Hetchy reservoir. While the irrigation systems can cost more than traditional sprinklers, the planting cost is comparable to normal landscaping and requires less maintenance.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
12 (118)	Provide education on energy efficiency.	Improve existing efforts to educate the public about ways in which they can save energy in their homes and businesses. This is a common measure included in the Attorney General recommendations and in many CAPs.	This would lower energy use in San Carlos, a sector that today contributes 23% of our GHG emissions. There would be costs associated with outreach, but there are agencies and private organizations available for partnering opportunities.

Solid Waste

13 (30)	For municipal operations, establish a Zero Waste policy.	Under a zero waste policy, everything would be recycled, minimal disposables would be allowed, and composting would be required. This would require considerable cooperation with the local garbage and recycling collection firm as well as the South Bayside Waste Management Authority (SBWMA). The Cities of Alameda and Palo Alto include a similar measure in their CAPs.	A zero waste policy would significantly decrease the amount of waste sent to landfills. It would also decrease the GHG emissions from landfills, which currently accounts for 5% of the City's emissions. There may be an increase in collection fees to residents or the City as a result of subsidizing the service, but costs are unknown at this time.
14 (30)	Establish an environmentally preferable purchasing program (EPP) for government operations.	Environmentally Preferable Purchasing, or EPP, refers to buying products and services with reduced effects on human health and the environment. An EPP policy would require that environmentally preferable products be purchased when possible and reasonable. The US EPA provides substantial guidance on this issue here: http://www.epa.gov/epp/ . This measure was added at the 9/16 CAP Subcommittee meeting.	An EPP policy for local government operations would establish the government as an example for citizens to follow in order to decrease their GHG emissions. The City already purchases recycled paper and hybrid vehicles, but expanding into carpets, building construction and other fleet vehicles is possible and often results in saving costs in the long run.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
15 (32)	Enhance the existing construction and demolition (C&D) waste reduction ordinance to increase reuse and recycling of construction and demolition waste to 75%.	C&D materials can include lumber, paper, cardboard, metals, masonry (brick, concrete, etc.), carpet, plastic, pipe (plastic, metal, and clay), drywall, rocks, dirt, and green waste related to land development. San Carlos adopted a construction and demolition debris diversion ordinance (Zoning Ordinance Chp 8.05) in 2000. It requires a construction/demolition permit applicant to address their waste before the permit is approved. There are also minimum amounts of the waste that must be recycled or reused according to type. The City of San Carlos could consider increasing the total amount of diverted C&D material to 75%. C&D ordinances are recommended by the Attorney General and in the Alameda, Berkeley, Marin, Palo Alto, and San Francisco CAPs.	According to the California Integrated Waste Management Board, Construction and Demolition materials account for 10.4% of business disposal. A stricter ordinance could reduce this number. Additionally, it is often less expensive to recycle or reuse C&D material than it is to dispose of it. Organizations such as RecycleWorks.org have instruction manuals on how to recycle or find reuse for almost all materials.
16 (33)	Target expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.	Increase recycling outreach to landlords and property managers about making recycling and compost bins available to tenants. The Cities of Berkeley, Palo Alto, and San Francisco have similar reduction strategies in their CAPs.	The amount of waste diverted from landfills would increase. Multi-family houses comprised about 32% of San Mateo County households in 2000, so there is a lot of potential for emissions reductions.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
17 (34)	Ensure that new Requests for Proposals (RFPs) for waste collection and processing services include Zero Waste service options (e.g., expanded organics collection, expanded C & D debris collection and container inspections upon collection).	This would require that new RFPs for waste collection include Zero Waste options (see above Zero Waste measure for explanation). A similar reduction measure is included in the Palo Alto CAP.	This would be a forward-thinking measure that would ensure that Zero Waste becomes a reality in San Carlos.
18 (38)	Make recycling mandatory at public events.	Public events are notorious for over-excessive packaging and disposable utensils, plates, and cups. Similar to the C&D requirements, public event permits would be conditional upon a waste plan. The event holder would have to agree to divert a certain amount of waste through recycling or composting in order to be awarded the permit. A similar reduction measure is included in the Palo Alto and draft Berkeley CAP.	This would increase public awareness of recycling and divert waste from landfills. There would be costs associated with staff time and education.

Transportation and Land Use

19 (46)	Encourage development that is mixed-use, infill, and higher density in order to support the reduction of vehicle trips, promote alternatives to individual vehicle travel, and promote efficient delivery of services and goods.	The principles of infill, high density, and mixed-use lead are also known as 'smart growth.' They are most effective when applied to a particular part of the City identified as needing infill development and increased vitality. A similar reduction measure is included in almost every Bay Area CAP and recommended by the Attorney General.	There are social benefits to these principles, including: better health, lower infrastructure costs, increased neighborhood vitality, and increased accessibility. There are also benefits to the environment because residents drive less. Mixed-use and higher-density development is already recommended through land use option three in the General Plan update process.
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San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
20 (50)	Increasing housing density near transit (transit overlay zone or transit oriented development).	Increasing housing density near transit is an excellent way to make a city more equitable, accessible, and lower greenhouse gas emissions from personal vehicles. The Cities of Alameda, Berkeley, Marin, San Mateo, and Sonoma County have similar reduction measures in their CAPs.	General Plan Land Use alternative 3 increases housing density consistent with this emission reduction measure. Implementing the alternative would mean decreased GHG emissions and a more economically and socially vibrant downtown.
21 (56, 88, 93)	Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, or walking. Provide safe and convenient pedestrian and bicycle connections to and from town centers, other commercial districts, office complexes, neighborhoods, school and other major activity centers, and surrounding communities.	Identify barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest (gyms, employment centers, schools, etc). This problem could be dealt with through one or more of the following: 1) Create a plan to address these problems and implement it, 2) Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location. The Attorney General recommends this measure.	As gas prices rise, residents of San Carlos will want to use alternative modes of transportation. The City should be prepared for this increase of walkers, bikers, and transit riders. This measure would require funding for bike lanes, sidewalk improvements, and transit signage, but would reduce traffic with the resulting reduced impacts to public works facilities.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
22 (64)	Encourage the planting of trees along streets to help improve airshed and minimize urban heat island effects by doing the following: a) Support community tree planting programs, b) require a specific tree coverage for all new development, and c) develop and implement a shading requirement for all City parking lots and streets.	Encompass the aforementioned measures in an urban forestry management plan that would do the following: support community tree planting, create a tree coverage percentage for all new development, require street trees to be planted at a certain rate per year, require that parking lots have a tree canopy. Tree planting is recommended by multiple CAPs, but this measure was largely derived from discussion at the 9/16 CAP Subcommittee.	Trees naturally sequester CO2 and create more oxygen. Additionally, they shade houses and pavement, thus reducing the urban heat island effect. Costs would include staff time for maintaining the program and the cost of planting and maintaining trees if on City property.
23 (67)	Create car sharing programs. Accommodations for such programs include providing parking spaces for the car share vehicles at convenient locations accessible by public transportation.	Car sharing programs like City Car Share (http://www.citycarshare.org/) and Zip Car (http://www.zipcar.com/) allow for members to reserve a car online for a minimal hourly rate. Car sharing is recommended by the Attorney General and currently used in Berkeley and San Francisco.	It has been found that car sharing has a major impact on the travel behavior of its members by reducing the number and length of trips. Once members give up their personal cars, the car is no longer the default mode of travel. Additional benefits include the more fuel-efficient models these car-sharing companies operate.
24 (69)	Consider providing incentives or requiring that developers of new residential and commercial projects make spaces available for car share vehicles and electric vehicle recharging stations.	This requirement or incentive would establish dedicated parking spaces for car share vehicles and/or electric vehicle recharging stations. The requirement could be written in to the parking requirements for new development or be used as an incentive or concession when approving use permits or variances. The City of Berkeley considers a similar measure for car share vehicles in its draft CAP.	By providing dedicated spaces for car share and electric vehicles, residents would be encouraged to buy or operate such vehicles. The cost to developers would depend on whether this parking space would be replacing a standard space or be in addition to the existing parking requirements.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
25 (78)	Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.	The City of San Carlos has already started to convert its vehicles to alternative fuels. The police chief and building inspection department uses hybrids and parking enforcement utilizes an electric utility vehicle. This program would expand upon current efforts. The Cities of Alameda and San Diego include similar measures in their CAPs.	Studies show that hybrid vehicles recoup their higher cost in 2-3 years. They also emit 80% less harmful pollutants and greenhouse gases than comparable gasoline cars. Electric cars have even greater benefits, although they are generally more expensive.
26 (80)	Offer prioritized parking for hybrid or alternative fuel cars.	There are two ways to offer prioritized parking for these vehicles: 1) Create conveniently-placed, dedicated parking spots (similar to handicapped parking spots) in which only certified hybrid or alternative fuel cars would be able to park and 2) Encourage large parking lots to dedicate the most conveniently placed parking spots (aside from handicapped spots) to certified hybrid or alternative fuel vehicles. The Cities of Marin, Palo Alto, San Mateo, and Sonoma County include similar measures in their CAPs.	This would increase demand for hybrid and alternative fuel cars, decreasing San Carlos' GHG emissions. There would be costs associated with planning, signage, and enforcement.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
27 (84)	Incorporate bicycle-friendly intersections into street design.	The San Carlos Bicycle/pedestrian Advisory Committee has made great strides in making San Carlos a bike- and ped-friendly city. Additional possibilities include increasing the number of class 2 bike lanes, creating cross signs and request buttons at bicycle level, and reevaluating the cross time intervals to ensure adequate cross timing for all users. The majority of CAPs for cities in the bay area encourage bicycle-friendly design.	Cycling is the most efficient way of traveling in terms of speed and emissions and should therefore be encouraged. There is cost associated with street redesign and signage.
28 (85)	For commercial projects, provide adequate bicycle parking near building entrances to promote cyclist safety, security, and convenience. Encourage large employers to provide facilities that encourage bicycle commuting, including locked bicycle storage, shower facilities, and covered or indoor bicycle parking.	Dedicated bike parking (in lieu of locking to trees and parking meters) reduces bike theft and increases convenience for cyclists. This reduction measure is recommended by the Attorney General. Similar language appears in the CAPs for Alameda, Berkeley, Palo Alto, San Francisco, and San Mateo.	An increase in convenient and safe bike parking could increase bike commuting, therefore reducing the GHG emissions associated with car travel within the City (currently 23% of emissions). There would be a cost for the bike racks and outreach to employers. Grants and funding are available to support bicycle related projects.
29 (90)	Provide for an education program and stepped up code enforcement to address and minimize vegetation that degrades access along public rights of way.	Trees and shrubs often clutter sidewalks, creating an accessibility and convenience issue. This program would educate residents on their responsibility to maintain public rights of way adjacent to their properties. It would also provide for increased enforcement and, possibly, an outlet for residents to report violations. This reduction measure is included in a list of compiled measures from the Cities of Aliso, Viejo, and Claremont.	Decreasing the barriers to pedestrian travel is not only an equity issue but it encourages more walking within the city, decreasing GHG emissions. Cost associated with public outreach and enforcement, but some revenue could be made if citations are given.

San Carlos Climate Action Plan Reduction Measures Under Consideration

# (prev. #)	Reduction Measure	Description	Cost / Benefit
30 (91)	Actively promote walking as a safe mode of local travel, particularly for children attending local schools. Employ traffic calming methods such as median landscaping, improve roadway capacity, and establish clear pedestrian rights of way.	There are design and policy methods to promote pedestrian travel, including: increased tree planting, median landscaping, clearly dedicated crosswalks (painted or paved differently), and count-down style cross signals. These strategies all promote enhanced aesthetics, reduced vehicle speeds, and safer pedestrian environments. This reduction measure is recommended by the Attorney General and by the Cities of Berkeley and San Francisco.	The cost would vary by method, but has been shown to lead to increased pedestrian travel and safety.
31 (95)	Provide shuttle service to public transit.	Provide shuttle service to and from areas not adequately served by public transit and the Caltrain station. This measure is recommended by the Attorney General and considered in the City of Alameda and County of Sonoma CAPs.	This will increase transit ridership, however the GHG emissions from shuttle vehicles and monetary cost of running such a service is unknown for San Carlos. If alternative fuels or hybrid vehicles are used in the shuttle buses, emissions would be significantly less than traditional vehicular options.

San Carlos Climate Action Plan: Analysis of 24 Reduction Measures Under Consideration

The purpose of this list is to analyze the emission reduction measures preferred by the Climate Action Plan Subcommittee and to reflect discussion at the Sept. 25th Community Workshop. All 31 emission reduction measures chosen by the Subcommittee on Sept. 16th (column 3) and voted for by the community on Sept. 25th (column 4) are reflected in this list, however some similar measures have been combined. This list separates each measure into its individual components in order to analyze whether a Greenhouse Gas (GHG) emission reductions or cost estimates can be made. It also gives qualitative information on the measures, especially where a numerical estimate cannot be made. This analysis will inform the Subcommittee's efforts to recommend 24 reduction measures and will also lead to greater specificity and clarity in the Climate Action Plan. *For more information on the categories below, including the methodology used, please see the Key on the last page.*

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
1	2	3	21	Adopt a Green Building Standard for all new development and major remodels. (Subcommittee priority)	#1: Building Efficiency / Site Design	<p>Apply a high LEED standard (silver or gold) for large-scale commercial buildings.</p> <p>Build it Green (BIG) standards for residential properties.</p> <p>Consider a lower certification (ex: LEED certified) for smaller scale commercial buildings.</p> <p>Provide additional training for zoning and building permit plan-checkers to enable them to become more familiar with the industry's latest green building techniques.</p>	<p>Yes- LEED silver and gold developments have quantifiable energy reductions that can be converted to GHG reductions based on the growth rate of new large-scale commercial construction.</p> <p>Yes- BIG has quantifiable emissions reductions for its certified properties. We can calculate GHG emission reduction based on the rate of new construction.</p> <p>Yes- LEED certified buildings have a quantifiable energy reduction that we can convert into GHG emissions based on the rate of small business growth.</p> <p>No- There are no GHG emissions associated with training, however this component is necessary to implement a Green Building Ordinance.</p>	<p>Yes- An Full Time Equivalent (FTE) estimation of city staff time is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p>	<p>This requirement would significantly lower the GHG emissions from new construction and eventually lead to decreased emissions from the commercial and residential sectors, which today create 41% of San Carlos' emissions. According to the US Green Building Council (USGBC), green building does the following: enhances and protects ecosystems and biodiversity, improves air and water quality, reduces solid waste, conserves natural resources, reduces operating costs, improves employee productivity and satisfaction, optimizes life-cycle economic performance, enhances occupant comfort and health, minimizes strain on local infrastructure, and contributes to overall quality of life. (1)</p>

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
2	19	3	8	Encourage development that is mixed-use, infill, and higher density in order to support the reduction of vehicle trips, promote alternatives to individual vehicle travel, and promote efficient delivery of services and goods. (Subcommittee priority)	#2: Auto Emission Reduction		Possible- Estimates from multiple agencies (USGBC, APA) and other sources could provide a GHG reduction estimate based on General Plan Land Use scenarios.	No- More specificity would be needed to estimate necessary staff time or city funding.	There are social benefits to these principles, including: better health, lower infrastructure costs, increased neighborhood vitality, and increased accessibility. There are also many environmental benefits. A 2005 Seattle study found that residents of neighborhoods where land uses were mixed and streets are better connected, making non-auto travel easier and more convenient, traveled 26 percent fewer vehicle miles than residents of neighborhoods that were more dispersed and less connected. (2) Mixed-use and higher-density development is already recommended through land use option three in the San Carlos General Plan update process.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
3	22	3	28	Encourage tree planting in order to improve airshed quality and minimize urban heat island effects (Subcommittee priority)	#1: Building Efficiency / Site Design	Support community tree planting programs. Require a specific tree coverage for all new development. Develop and implement a shading requirement for all City parking lots and streets.	No- Until the level of support and rate of tree planting is known, a GHG emission reduction cannot be quantified. The age of trees can also affect GHG reduction capability. Possible- While there is data on temperature decreases resulting from increased tree coverage, it is unclear how this would affect air conditioning usage or pedestrian behavior. Yes- There is data on temperature decreases resulting from increased tree coverage and how that affects energy usage.	No- More specificity needed. Monetary support or administrative support? Tree planting programs need City support to help with identifying whether a desired tree location conflicts with City plumbing, wiring, or paving. Yes- An FTE estimation is possible based on other case studies. Possible- Similar programs for parking lot and street shading can be given. Public Works may be able to estimate tree planting and maintenance costs.	Trees naturally sequester CO2 and create more oxygen. Additionally, they shade houses and pavement, thus reducing the urban heat island effect. Air temperature differences of approximately 3.6°F to 7.2°F have been observed for urban neighborhoods of contrasting tree cover, averaging approximately 1.8°F per 10% canopy cover. (3)
4	12, 29	2.5	5, 6	Community education about climate change and enforcement codes. (Subcommittee priority)	#4: Alternative, Non-Automotive Travel Modes	Provide for an education program and stepped up code enforcement to address and minimize vegetation that degrades access along public rights of way.	Possible- The emissions reductions resulting from education programs and increased walkability is difficult to separate from emissions reductions from other influences, however information is just now becoming available on this subject.	Yes- An FTE estimate for education and enforcement is possible.	This would lower energy use in San Carlos, a sector that today contributes 23% of the community's GHG emissions. The exact reduction in emissions is difficult to calculate, but community awareness of energy consumption and climate change is essential for change to occur. There are agencies and private organizations available for partnering opportunities.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
					#1: Building Efficiency / Site Design	Provide education on energy efficiency.	Possible- The emissions reductions resulting from education programs is difficult to separate from emissions reductions from other influences, however information is just now becoming available on this subject.	Yes- An FTE estimate could be made based on an assumption of the level of education to the community.	
5	13	2	7	For municipal operations, establish a Zero Waste policy. (Subcommittee priority)	#5: Zero Waste		Yes- A zero waste policy would negate the 2020 projection for 'business as usual' solid waste production.	Yes- An estimate of FTE for education and oversight and contract revision to waste management operations is possible.	A zero waste policy would significantly decrease the amount of waste sent to landfills, thus reducing the GHG emissions released from landfills (currently 5% of the City's emissions). There may be an increase in collection fees to residents or the City as a result of subsidizing the service, but costs are unknown at this time. The majority of entities that have implemented zero waste policies at this time are businesses. According to the Zero Waste Alliance, Hewlett Packard in Roseville, CA reduced its waste by 95% and saved \$870,564 in 1998. Interface, Inc. in Atlanta, GA has eliminated over \$90M in waste from a zero waste policy. (4)

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
6	28	3	20	Increase bike parking	#4: Alternative, Non-Auto Travel Modes	<p>Require large employers to provide facilities that encourage bicycle commuting, including locked bicycle storage, shower facilities, and covered or indoor bicycle parking.</p> <p>For commercial projects, provide adequate bicycle parking near building entrances to promote cyclist safety, security, and convenience.</p>	<p>No- It is unclear how these facilities will affect community travel behavior. A commuter survey would help in making this measure quantifiable.</p> <p>No- It is unclear how these facilities will affect community transit behavior. A commuter survey would help in making this measure quantifiable.</p>	<p>Yes- An FTE estimation is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p>	<p>The City of Portland requires one bike parking space per 3,000 square feet of commercial or office space or 5-10% of the number of automobile spaces. The City of Santa Cruz requires two bike parking spaces plus 15% of the number of automobile spaces. Additionally, 20-60% of new bike spaces in Santa Cruz are required to be Class 1, or individual lockers. The City of Vancouver requires any development with four or more bike parking spaces to provide shower and wash bin facilities. (5)</p>
7	25	3	9	Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.	#4: Alternative, Non-Auto Travel Modes		<p>Possible- Based on an estimate of how many fleet vehicles will be converted to hybrid or electric vehicles, an estimate of emissions reductions can be made. The municipal emissions inventory numbers are needed for this determination.</p>	<p>Possible- the cost of hybrid and electric vehicles is known in comparison to a traditional gas vehicle. Based on an estimate of how many fleet vehicles would be converted per year, a total cost estimate could be calculated.</p>	<p>Studies show that hybrid vehicles recoup their higher cost in 2-3 years (6). They also emit 80% less harmful pollutants and greenhouse gases than comparable gasoline cars (7). Electric cars have even greater benefits, although they are generally more expensive.</p>
8	23	2	7	Promote car sharing programs	#4: Alternative, Non-Auto Travel Modes	<p>Create a car sharing program.</p> <p>Provide parking spaces for the car share vehicles at convenient locations accessible by public transportation.</p>	<p>Possible- The communities in which VMT reductions have been measured as a result of car sharing programs can be compared to San Carlos, however surveys are needed to accurately estimate a GHG equivalent.</p> <p>No- This measure would depend on whether the parking spaces were new or existing. It is also unclear how increased parking for car share vehicles would affect commuter behavior.</p>	<p>Yes- An FTE estimate for program management can be quantified based on similar programs.</p> <p>Yes- An FTE estimate for enforcement and program management is possible.</p>	<p>In San Francisco, car share members' daily VMT (weekday/workday) fell from 2.80 to 1.49 miles. Among the control group of non-members, it rose from 5.45 to 20.85. These figures refer to second-year impacts; first-year impacts showed a net increase in VMT. In Arlington, VA members reported a reduction in VMT of 43%, or 3,250 miles per year. 45% of respondents reported reducing driving after joining car-sharing, while 35% said they increased their driving. Nearly half of respondents (49%) said they walk more often because of their involvement in car sharing, and 54% said they use transit more often. (8)</p>

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
9	30, 27	2	35, 32	Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.	#4: Alternative, Non-Auto Travel Modes	<p>Traffic calming method: landscaped median barriers.</p> <p>Traffic calming method: establish clear pedestrian rights of way.</p> <p>Incorporate bicycle-friendly intersections into street design.</p>	<p>No- Median barriers slow traffic, but it is unclear how these new traffic patterns will affect the pedestrian and cycling rate in San Carlos.</p> <p>No- Clear pedestrian rights of way slow traffic and decrease rates of vehicle-pedestrian collisions, however it is unclear how these new traffic patterns will affect the pedestrian and cycling rate in San Carlos.</p> <p>Possible- Bicycle-friendly intersections increase bicycle trips, however it is unclear whether these trips are recreational or in lieu of vehicle trips. A community survey would help clarify which bicycle-friendly measures would be most effective in changing commuter behavior.</p>	<p>Yes- Fehr and Peers, a transportation engineering firm, estimates that median barriers cost \$15,000-\$20,000 per 100 ft. Specific estimates could be obtained by Public Works. (9)</p> <p>Yes, depending on the method- Raised crosswalks cost an estimated \$4,000 each. (11) Painting crosswalks in bold stripes is less expensive, yet also effective, and cost estimates may be obtained from Public Works.</p> <p>Yes- A typical bike lane costs \$52,000 per mile, or 30¢ per 2.1 mile bicycle trip if used by 80 cyclists a day, while a typical new sidewalk is estimated to cost 12¢ per trip. (12)</p>	<p>Median barriers cause an average 31% decrease in traffic volume, or a decrease of 1167 vehicles per day (from a sample of 10 sites; average includes various types of volume control measures) (10)</p> <p>Communities that improve cycling conditions often experience significant increases in bicycle travel and related reductions in vehicle travel. For U.S. cities with more than 250,000 population, each additional mile of bike lanes per square mile is associated with a roughly one percentage point increase in bicycle commute mode share. (13)</p>

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
10	18	2	20	Make recycling and composting mandatory at public events.	#5: Zero Waste	The event holder would have to agree to divert a certain amount of waste through recycling or composting in order to be awarded a permit.	No- There is no data on how much waste is generated at public events within San Carlos. General estimates are available but they cannot be suited to San Carlos accurately.	Yes- Cost would be minimal since the requirement would be folded into an existing contract process. Some staff time required to prepare contract revisions and an FTE estimate could be made.	The City of San Francisco passed an ordinance requiring recycling at special events. This, along with their ban on polystyrene food service ware, helped the city achieve a 70% waste diversion rate in 2006. California law (AB 2176) already requires large public venues and special events to develop and implement solid waste management plans.(14)
11	3,4, 5	2	15, 7, 12	Improve residential energy efficiency	#1: Building Efficiency / Site Design	Consider establishing energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards applied to the City's climate zone.	No- Until the energy efficiency standards are decided upon, a good estimate of energy reductions cannot be made.	No- An estimate of time required to create new standards will become clearer once the new Title 24 energy standards are released.	These standards could significantly reduce the 23% of San Carlos GHG emissions from electricity. All new construction and additions have been required to meet minimum energy efficiency standards since 1978. The State of California is currently updating its Title 24 requirements for 2009. The City would consider establishing standards exceeding the State's standards at that time. (15)
						Perform energy-efficient lighting retrofits and/or home energy audits.	Yes- Lighting retrofits have a quantifiable average energy savings associated with them. An estimate for San Carlos can be generated from these average energy savings in other communities and an assumption as to how many households can be served.	No- An estimate of time and money required to perform energy-efficient lighting retrofits would depend on the level of partnership with local electricity providers and the availability of grant money, both of which are unknown.	This would be a way to reach out to homes built before the Title 24 standards came into effect in 1978. The program could benefit from partnerships with citizen-run organizations, PG&E, and auditors.
						Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	No- Studies are currently underway to measure the effectiveness of subsidized energy and water saving devices.	No- Some staff time, yet the division of responsibility between the City and PG&E is unknown.	It is important to protect all residents from climate change equally. There are numerous funding sources for programs such as these, including federal grants, the State of California Low-Income Energy Efficiency (LIEE) Program, and PG&E's Energy Partners Program.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
						Expand and better integrate programs that increase energy efficiency in low-income households.	No- There are examples of energy savings from similar communities, but the emissions reductions cannot be clearly quantified until 'low-income' is defined and a scope is created.	No- The cost of this program depends on the division of responsibility between the City, private organizations, and PG&E. The cost of similar programs in the Bay Area can be given.	
12	11	2	14	Create water- and waste-efficient landscapes. Native vegetation, smart sensors for watering, reduced concrete cover, etc.	#1: Building Efficiency / Site Design	Use water- and waste-efficient landscaping in City Park renovations	No- The water and waste reductions associated with these practices cannot be measured in GHG equivalent, however there is a quantifiable water use reduction from the USGBC.	No- The cost of water- and waste- efficient landscaping is comparable to traditional landscaping, however the initial cost cannot be calculated without a more specific scope and assistance from Public Works.	This measure saves water and thus the energy used for water filtration and movement. It also lowers the amount of yard waste sent to landfills and reduces demand on our supply of fresh water, which largely comes from the Hetch Hetchy reservoir. The City of Menlo Park has a water-efficient landscape ordinance requiring all new development and landscape renovations to submit a landscape plan with sprinkler flow rates, a soils test, irrigation schedule, plant selection, and more. (15)
						Encourage practice in new and existing properties.	No- The water and waste reductions associated with these practices cannot be measured in GHG equivalent.	Yes- An FTE estimation is possible based on other case studies.	
13	31	2	13	Provide shuttle service to public transit.	#4: Alternative, Non-Auto Travel Modes	Provide shuttle service to and from areas not adequately served by public transit and the Caltrain station.	Possible- It is unclear how the availability of a shuttle service would affect community travel behavior. Community surveys and historical data may provide context. Defining a service area would also help to develop ridership estimates.	Yes- Based on assumptions of new vehicle cost, average daily trips, mileage, and driver salary, a cost to the City could be estimated.	The City of Emeryville has operated a shuttle system since the mid-1990's. Named the Emery-Go-Round, it connects major commercial and residential areas to transit. In 2005, Emeryville was recognized by the EPA as one of the "Best Places to Work" as a result of the Emery-Go-Round. In addition, the shuttle helped spur development of brownfield sites surrounding the Emeryville Amtrak Station. (16)
14	9	2	12	Identify opportunities for increasing the following:	#3: Low Carbon Energy Use	Solar system installations	Possible- More specificity is needed before an estimate can be made.	Possible- More specificity is needed before an estimate can be made.	GHG emission reductions vary with different technologies and models, therefore it is difficult to make an estimate before a more specific scope is detailed.
						Wind energy generation	Possible- More specificity is needed before an estimate can be made.	Possible- More specificity is needed before an estimate can be made.	

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
						Solar and tankless hot water heaters	Possible- More specificity is needed before an estimate can be made.	Possible- More specificity is needed before an estimate can be made.	
						Energy efficient ventilation and air conditioning	Possible- More specificity is needed before an estimate can be made.	Possible- More specificity is needed before an estimate can be made.	
						Research biomass energy opportunities.	Possible- More specificity is needed before an estimate can be made.	Possible- More specificity is needed before an estimate can be made.	
15	6, 7, 8	2	11	Expand energy saving opportunities to businesses.	#1: Building Efficiency / Site Design	Develop a tax rebate program for efficiency improvements in businesses.	No- It is unclear how a tax rebate program will affect efficiency in businesses.	No- An FTE estimation cannot be made until the scope of the rebate program is established. The loss in tax revenue to the City cannot be estimated either until a more specific scope is established.	San Carlos' businesses create 20% of the City's GHG emissions. This rebate program would act as an incentive for more businesses to become energy efficient by decreasing their energy use and emissions. The City of Berkeley and the City of Oakland Smart Lights program provides businesses with hands-on assistance in assessing lighting needs and installing high-quality, energy-efficient appliances. Through the program, small businesses have reduced energy costs by 20-50% and improved lighting quality. Most of the participating businesses recover their costs in less than one or two years. Their program has also saved 3.5 million kWh of energy, \$580,000, and 850 tons of CO2e over five years.(17)
						Expand energy saving opportunities for large commercial and industrial properties.	No- The benefit from energy saving opportunities for large commercial properties is unclear. The benefit to industrial properties could never be quantified to due privacy laws.	No- The cost of this program depends on the division of responsibility between the City, private organizations, and PG&E.	
						Educate and give hands-on assistance to small businesses (less than 20 employees).	Yes- There have been similar programs in bay area cities. The results of those programs could be modified to apply to San Carlos' business pool.	No- An FTE estimate could be made for staff coordination of the project, yet the cost of materials and labor for hands-on assistance is too variable to make a good estimate.	

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
16	14	2	10	Establish an environmentally preferable purchasing program (EPP) for government operations.	#5: Zero Waste		No- Examples of EPP emissions savings can be given, but until the government inventory is completed, a numerical estimation of emissions reductions is infeasible.	Yes- An FTE estimation is possible based on other case studies.	An EPP policy for local government operations would establish the government as an example for citizens to follow in order to decrease their GHG emissions. The City already purchases recycled paper and hybrid vehicles, but expanding into carpets, building construction and other fleet vehicles is possible and often results in saving costs in the long run.
17	15	2	9	Enhance the existing construction and demolition (C&D) waste reduction ordinance to increase diversion of construction and demolition waste to 75%.	#5: Zero Waste		Yes- The tonnage of waste diverted from future construction can be estimated and then converted into CO2e.	Yes- An FTE estimation is possible based on other case studies.	According to the California Integrated Waste Management Board, Construction and Demolition materials account for 10.4% of business disposal. A stricter ordinance could reduce this number. Additionally, it is often less expensive to recycle or reuse C&D material than it is to dispose of it. Organizations such as RecycleWorks.org have instruction manuals on how to recycle or find reuse for almost all materials.(18)
18	16	2	9	Target expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.	#5: Zero Waste		No- It is unclear how expanded recycling services to multi-family residential buildings will affect community behavior. A survey would help if possible.	Yes- An FTE estimation is possible based on other case studies.	The amount of waste diverted from landfills would increase. Multi-family houses comprised about 32% of San Mateo County households in 2000, so there is a lot of potential for emissions reductions.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
19	20	2	7	Increasing housing density near transit (transit overlay zone or transit oriented development).	#1: Building Efficiency / Site Design		Possible- Multiple sources estimate how housing density near transit can affect community transit ridership or decrease personal vehicle VMT. A survey would help in quantifying this measure.	No- The City is already considering increased density near transit in General Plan update land use option 3. The future FTE needed to modify housing density near transit depends on the Land Use option chosen for the General Plan.	A study of the Portland area found that 30% or more of the Transit Oriented Development residents commuted by the regional light rail system at least once a week and 23-33% used transit as their primary commute mode. This compares to less than 10% of workers in the automobile-oriented suburbs of Hillsboro and Beaverton with 15% of Portland workers. Overall, transit commuting increased when people moved to TODs. A 2003 California TOD travel characteristics study found TOD office workers within 1/2 mile of rail transit stations to have transit commute shares averaging 19% as compared to 5% region wide. For residents, the statewide average transit share for TODs within 1/2 mile of the station was 27% compared to 7% for residences between 1/2 mile and 3 miles of the station. (19)
20	26	2	7	Offer prioritized parking for hybrid or alternative fuel cars on City streets.	#4: Alternative, Non-Auto Travel Modes		Possible- It is unclear how prioritized parking would influence the community at this time, however new information is just now becoming available.	Yes- An estimate of re-painting parking spaces and adding signage could be made.	
21	10	2	6	Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	#1: Building Efficiency / Site Design		No- The reduction in GHG emissions will be unclear until the Government Operations audit is completed.	No- The initial cost will not be available until the Government Operations audit is completed.	The energy-saving measures will save the City money on electricity while lowering its GHG emissions. It will also establish the City as an example for privately-owned facilities to follow.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
22	24	2	6	Consider providing incentives or requiring that developers of new residential and commercial projects make spaces available for car share vehicles and electric vehicle recharging stations.	#2: Auto Emission Reduction		No- It is unclear how car share parking spots and electric vehicle recharging stations will influence community behavior.	Yes- An FTE estimate to revise ordinances and codes is possible.	
23	21	1	23	Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, or walking.	#4: Alternative, Non-Auto Travel Modes	<p>Identify barriers to safe or convenient walking, biking, and transit ridership from major residential areas to public areas of interest (gyms, employment centers, schools, etc).</p> <p>Create a plan to address these problems and implement it.</p> <p>Public outreach campaign.</p> <p>Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location.</p>	<p>Yes- Identifying barriers does not have a GHG equivalent, yet it is necessary for implementation.</p> <p>No- An estimate of increased cyclist activity cannot be made until the plan is written.</p> <p>Possible- There are other examples and research from the Urban Land Institute that could be used to estimate the effectiveness of a public outreach campaign in San Carlos.</p> <p>No- It is unclear how these conditions of approval will affect community behavior.</p>	<p>Yes- An FTE estimation is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p> <p>Yes- An FTE estimation is possible based on other case studies as well as an estimation of costs of materials.</p> <p>Yes- An FTE estimation is possible based on other case studies.</p>	As gas prices rise, residents of San Carlos will want to use alternative modes of transportation. The City should be prepared for this increase of walkers, bikers, and transit riders. This measure also promotes equity.

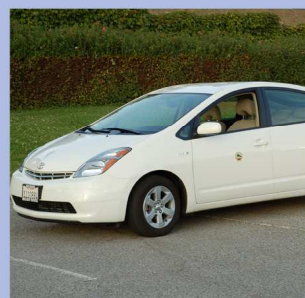
#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
24	17	1	5	Ensure that new Requests for Proposals (RFPs) for waste collection and processing services include Zero Waste service options (e.g., expanded organics collection, expanded C & D debris collection and container inspections upon collection).	#5: Zero Waste		No- It is unclear how the option of Zero Waste service will affect the waste generating behavior of the community.	Yes- An FTE estimate associated with contract modification and enforcement is quantifiable.	This would be a forward-thinking measure that would ensure that Zero Waste becomes a reality in San Carlos. For more information on the benefits of zero waste, see measure #17.

#	9/25 #	Subcommittee Preference	Community Votes	Reduction Measure	Strategic Policy Focus	Components	GHG Quantifiable?	Initial Cost Quantifiable?	Qualitative Information
Key "Subcommittee Priority": This notation signifies that at least two Subcommittee members identified the measure as in their top five at the 9/16 Subcommittee meeting. Preferences are based on the draft minutes from that meeting date. "GHG Quantifiable?": This category addresses the question of whether a specific, numeric reduction in GHG emissions can be estimated based on similar case studies, current research, and San Carlos characteristics. "Initial Cost Quantifiable?": This category addresses whether a specific, numeric initial cost can be estimated based on case studies, previous expenditures by the City of San Carlos, and current research. Due to time and budget constraints and lack of life-cycle financial research, only the initial cost is addressed in this document. For both the GHG and Initial Cost Columns, "Yes" = There is sufficient information and research to make a good estimate. "No" = There is not enough research or available data applicable to San Carlos to make an estimate. "Possible" = The estimate is based on information that is not yet available, yet could be available the time the CAP is released. Conversely, "possible" could mean that more specificity is needed in order to make quantification feasible. "Qualitative Information": Climate Change is not strictly science-based. Qualitative, non-numerical information can make a difference in decision-making as well. This section gives examples on some of the qualitative research or ideas concerning each reduction measure. Although some of this information may be quantitative, it is not typically transferable to dollars or GHG equivalent for San Carlos and is thus qualitative.							Footnotes (1) US Green Building Council (USGBC), www.usgbc.org, accessed Sept. 30, 2008. (2) US Environmental Protection Agency (EPA). "Environmental Benefits of Smart Growth." http://www.epa.gov/dced/topics/eb.htm, accessed Oct. 1, 2008. (3) Scott, Simpson, and McPherson. "Effects of Tree Cover on Parking Lot Microclimate and Vehicle Emissions." Journal of Arboriculture 24(3): May 1999, 129. (4) Zero Waste Alliance, http://www.zerowaste.org/case.htm#benefits, accessed Sept. 30, 2008. (5) Victoria Transport Policy Institute. "Bicycle Parking." Online TDM Encyclopedia, http://www.vtpi.org/tdm, accessed Sept. 30, 2008. (6) Hybrid Car Organization, www.hybrid-car.org, accessed Sept. 20, 2008. (7) Carte, Sharon Silke. "Hybrids recoup higher cost in less time." USA Today, 5/12/2008, http://www.usatoday.com/money/autos/environment/2008-05-11-hybrids-gas-prices_N.htm. (8) Cervero, Robert and Tsai, Yu-Hsin (2003). San Francisco City CarShare: TravelDemand Trends and Second-Year Impacts. University of California at Berkeley, Institute of Urban and Regional Development. Working Paper 2003-05. (9-13) Fehr and Peers, TrafficCalming.org, http://www.trafficcalming.org, accessed Sept. 30, 2008. (14) US EPA, "Recycling on the Go Success Story," http://epa.gov/osw/conserve/rrr/rogo/documents/sf-ca-30, 2008. (15) City of Menlo Park, "Water-efficient Landscaping Ordinance." http://www.menlopark.org/departments/waterlandord.pdf, accessed Sept. 30, 2008 (16) City of Emeryville Planning Department. "Opportunities and Constraints: Sustainability." http://www.ci-emeryville.ca.gov/Opportunities%20and%20Challenges/10SUSTAIN.pdf, accessed Oct. 1, 2008. (17) City of Berkeley Draft Climate Action Plan, www.berkeleyclimateaction.org, accessed September 5, 2008. (18) California Integrated Waste Management Board, www.ciwmb.ca.gov/organics/xeriscaping, accessed Sept. 30, 2008. (19) Victoria Transport Policy Institute. "Transit Oriented Development." Online TDM Encyclopedia, http://www.vtpi.org/tdm, accessed Sept. 30, 2008.		

Appendix E: San Carlos Municipal Greenhouse Gas Emissions Inventory, 2005

Prepared by ICLEI – Local Governments for Sustainability, September 2009

City of San Carlos 2005 Government Operations Greenhouse Gas Emissions Inventory



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Joint Venture: Silicon Valley Network



Russell Hancock, President and Chief Executive Officer

Established in 1993, Joint Venture provides analysis and action on issues affecting the Silicon Valley economy and quality of life. The organization brings together established and emerging leaders—from business, government, academia, labor, and the broader community—to spotlight issues, launch projects, and work toward innovative solutions.

Joint Venture has convened representatives from the 42 cities and counties in Silicon Valley as a [Climate Protection Task Force](#) to develop strategies for reducing greenhouse gas emissions from city, county, and other agencies' operations. The program includes conducting inventories of emissions from publicly owned buildings, vehicles, waste treatment plants and other facilities. Then goals for reducing emissions can be set and targets of opportunity developed. The Task Force will explore forming purchasing pools to get the best prices on capital equipment, such as hybrid vehicles and solar panels, to help achieve emissions reduction goals.

The City of San Carlos is a Charter Member of the Climate Protection Task Force. The Assistant City Manager in San Carlos sits on the Executive Committee of the Climate Protection Task Force.

<http://www.jointventure.org>

Sustainable Silicon Valley

Marianna Grossman, Executive Director



Sustainable Silicon Valley (SSV) is a collaboration of businesses, governments, and non-governmental organizations that are identifying and addressing environmental and resource pressures in the Valley. As its first initiative, SSV is engaging prominent Valley organizations to work toward self-imposed goals of reducing regional carbon dioxide (CO₂) emissions. The SSV approach is to facilitate strategies to reduce CO₂ emissions through increased energy and fuel efficiency and through the use of renewable sources of energy. SSV envisions a thriving Silicon Valley with a healthy environment, a vibrant economy, and a socially equitable community. Sustainable Silicon Valley's mission is to lead the Silicon Valley community to create a more sustainable future by engaging and collaborating with local government agencies, businesses, and community organizations to identify and help address the highest priority environmental issues in the Valley.

<http://www.sustainablesiliconvalley.org>

ICLEI-Local Governments for Sustainability USA

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ICLEI-Local Governments for Sustainability is a membership association of more than 1,000 local governments worldwide—more than 500 in the United States—committed to advancing climate protection and sustainability. Through technical expertise, direct network engagement, and the innovation and evolution of tools, ICLEI strives to empower local governments to set and achieve their emissions reduction and sustainability goals.

<http://www.icleiusa.org>

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Executive Summary

The City of San Carlos has recognized that climate change is a reality, with potentially disruptive effects to the City's residents and businesses. San Carlos also recognizes that local governments play a leading role in both reducing greenhouse gas emissions and mitigating the potential impacts of climate change. Local governments can dramatically reduce the emissions from their government operations by such measures as increasing energy efficiency in facilities and vehicle fleets, utilizing renewable energy sources, sustainable purchasing, waste reduction, and supporting alternative modes of transportation for employees. The co-benefits of these measures may include lower energy bills, improved air quality, and more efficient government operations.

San Carlos has begun its efforts to address the causes and effects of climate change with the assistance of the partners in the Silicon Valley Climate Protection Partnership. These partners include Joint Venture: Silicon Valley Network; Sustainable Silicon Valley; local governments in San Mateo, Santa Clara, and Santa Cruz counties; and ICLEI-Local Governments for Sustainability USA.

This greenhouse gas emissions inventory represents completion of an important first step in the City's climate protection initiative. As advised by ICLEI, it is essential to first quantify emissions to establish:

- A baseline emissions inventory, against which to measure future progress.
- An understanding of the scale of emissions from the various sources within government operations.

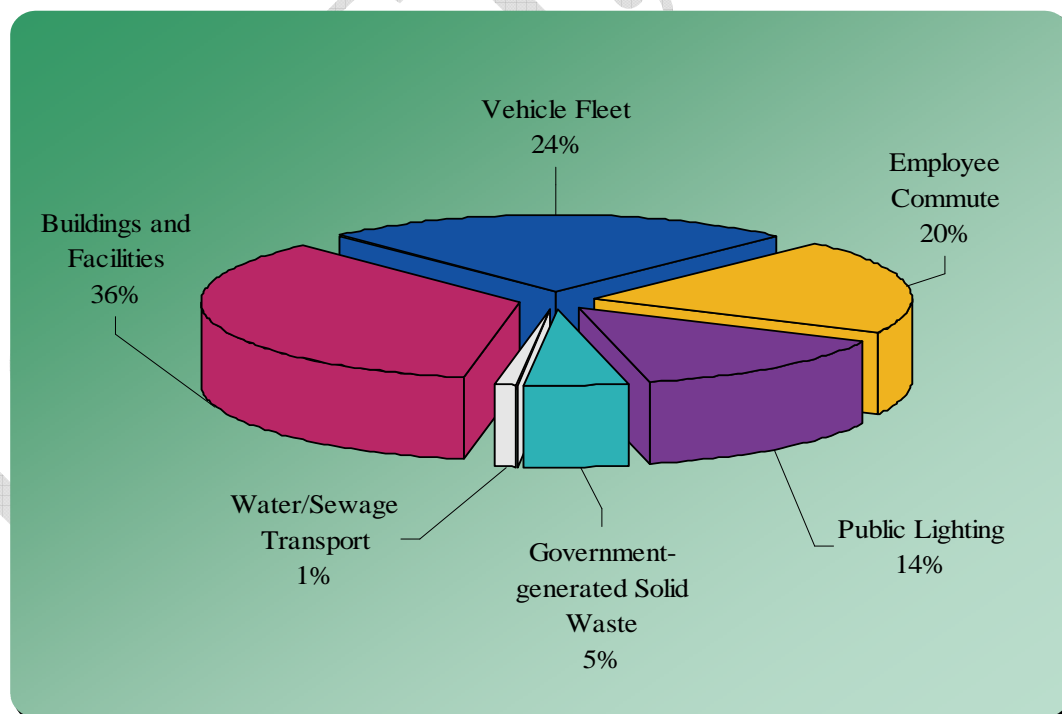
Presented here are estimates of greenhouse gas emissions in 2005 resulting from San Carlos' government operations. With one exception,¹ all emissions estimates in this report refer to emissions generated from sources

¹ The exception is emissions from employee-owned vehicles that are used by employees during commuting.

over which the City has direct operational control, exclusive of physical location.² This includes all government-operated facilities, streetlights, and other stationary sources; vehicle fleet and off-road equipment; and waste generated by government operations. The inventory *does not* estimate emissions from the larger community—these will be addressed in the community-scale greenhouse gas emissions inventory. Therefore, this inventory should be considered to be an independent analysis relevant only to San Carlos' internal operations.

This inventory is one of the first inventories to use a new national standard developed and adopted by the California Air Resources Board (ARB) in conjunction with ICLEI, the California Climate Action Registry, and The Climate Registry. This standard, called the Local Government Operations Protocol (LGOP), provides standard accounting principles, boundaries, quantification methods, and procedures for reporting greenhouse gas emissions from local government operations. To that end, LGOP represents a strong step forward in standardizing how inventories are conducted and reported, providing a common national framework for all local governments to establish their emissions baseline. This and all emissions inventories represent an estimate of emissions using the best available data and calculation methodologies. Emissions estimates are subject to change as better data and calculation methodologies become available in the future. Regardless, the findings of this inventory analysis provide a solid base against which San Carlos can begin planning and taking action to reduce its greenhouse gas emissions.

Figure ES.1 2005 Government Operations Emissions by Sector



² Facilities, vehicles, or other operations wholly or partially owned by, but not operated by, the City of San Carlos are not included in this inventory. See Appendix A for more details on the boundaries of the inventory.

Inventory Results

In 2005, San Carlos' direct emissions, emissions from electricity consumption, and select indirect sources totaled 1,743 metric tons of CO₂e.³ Of the total emissions accounted for in this inventory, emissions from buildings and facilities were the largest (36 percent as shown in Figure ES.1 and Table ES.1). The remaining emissions reported in this inventory came from the City's vehicle fleet (24 percent), employee commute (20 percent), public lighting (14 percent), government-generated solid waste (5 percent), and water transport (1 percent).

Cumulatively, the City of San Carlos spent approximately \$523,419 on energy (natural gas, electricity, diesel, and gasoline) for government operations in 2005.⁴ Sixty-four percent of these energy expenses (\$335,255) resulted from electricity consumption, and 11 percent (\$58,036) from natural gas purchases from PG&E and ABAG Power. Fuel purchases (gasoline and diesel) for the vehicle fleet and mobile equipment totaled \$130,127 or 25 percent of total costs included in this inventory. In addition to these direct costs, the City of San Carlos received waste disposal service in 2005 with an estimated value of \$58,139.⁵ Beyond reducing greenhouse gases, any future reductions in municipal energy consumption will have the potential to reduce these costs, enabling San Carlos to reallocate limited funds toward other municipal services or create a revolving energy loan fund to support future climate protection activities.

Table ES.1 2005 Government Operations Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO ₂ e)
Buildings and Facilities	613
Vehicle Fleet	425
Employee Commute	353
Public Lighting	241
Government-generated Solid Waste	93
Water/Sewage Transport	18

³ This number represents a "roll-up" of emissions, and is not intended to represent a complete picture of emissions from San Carlos' operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total.

⁴ See Table 3.3 for more information on costs.

⁵ While, in 2005, the City did not pay directly for waste hauling services (these costs were—and are currently—bundled under the franchise agreement with Allied Waste through the SBWMA and passed on to tax-payers), the monetary value of these services has been quantified to help inform policy decisions.

Key Findings

- The greatest source of greenhouse gas emissions from government operations in 2005 was City buildings (613 metric tons of CO₂e).
- More than 70 percent of emissions from City buildings came from City Hall and the Maintenance Yard.⁶
- The second largest source of emissions from government operations in 2005 was fuel use associated with the vehicle fleet and mobile equipment (425 metric tons of CO₂e).
- Approximately 65 percent of 2005 vehicle fleet emissions came from the activities of the Police and Fire Departments (together producing approximately 279 metric tons of CO₂e).⁷
- Employee commute patterns in 2005 generated an estimated 353 metric tons of CO₂e, even when nearly 40 percent of employees live within 6 miles of work.⁸
- Cumulatively, the City of San Carlos spent approximately \$523,419 on energy (electricity, natural gas, gasoline, and diesel) for its buildings, streetlights, water transport infrastructure, vehicles and off-road equipment in 2005.
- Sixty-four percent of total energy costs are attributed to electricity purchased from PG&E (\$335,255).

⁶ See Section 3.4.1 for more information on City buildings.

⁷ See Section 3.4.4 for more information on the City vehicle fleet and mobile equipment.

⁸ See Section 3.4.6 for more information on employee commute.

Section One: Introduction





Introduction

Local governments play a fundamental role in addressing the causes and effects of human-caused climate change through their actions at both the community and government operations levels. While local governments cannot solve the problems of climate change by themselves, their policies can dramatically reduce greenhouse gas emissions from a range of sources and can prepare their communities for the potential impacts of climate change.

Within the context of government operations, local governments have direct control over their emissions-generating activities. They can reduce energy consumption in buildings and facilities, reduce fuel consumption by fleet vehicles and equipment, reduce the amount of government-generated solid waste that is sent to a landfill, and increase the amount of energy that is obtained through alternative energy sources. By quantifying the emissions coming from its operations, this report will enable the City of San Carlos to choose the most effective approach to reducing its contribution to climate change.

1.1 Climate Change Background

A balance of naturally occurring gases dispersed in the Earth's atmosphere determines its climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence suggests that modern human activity is artificially intensifying the greenhouse gas effect, causing global average surface temperatures to rise. This intensification is caused by activities that release carbon dioxide and other greenhouse gases into the atmosphere—most notably the burning of fossil fuels for transportation, electricity, and heat generation.

Rising temperatures affect local and global climate patterns, and these changes are forecasted to manifest themselves in a number of ways that might impact San Carlos. For example, the San Francisco Bay may experience rising sea levels and the Sacramento Delta may experience changes in salinity, affecting land uses, water sources,

and agricultural activity. Changing temperatures will also likely result in more frequent and damaging storms accompanied by flooding and landslides. Reduced snow pack in the Sierra Nevada mountains may lead to water shortages, and the disruption of ecosystems and habitats is likely to occur.

In response to this threat, many communities in the United States are taking responsibility for addressing climate change at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around sustainable land use patterns, transportation demand management, energy efficiency, green building, and waste diversion, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts. As the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses.

1.2 Purpose of Inventory

The objective of this greenhouse gas emissions inventory is to identify the sources and quantities of greenhouse gas emissions resulting from government operations in San Carlos in 2005. This inventory is a necessary first step in addressing greenhouse gas emissions, serving two purposes:

- It creates an emissions baseline against which the City can set emissions reductions targets and measure future progress.
- It allows local governments to understand the scale of emissions from the various sources within their operations.

While San Carlos has already begun to reduce greenhouse gas emissions through its actions (see Section 1.4 for more detail), this inventory represents the first step in a systems approach to reducing the City's emissions. This system, developed by ICLEI, is called the Five Milestones for Climate Mitigation. This Five-Milestone process involves the following steps:

Milestone One: Conduct a baseline emissions inventory and forecast

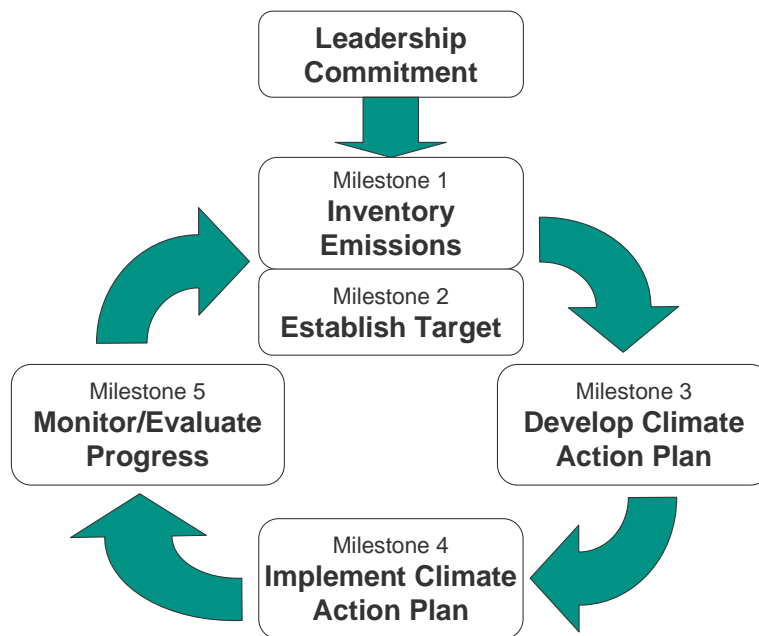
Milestone Two: Adopt an emissions reduction target for the forecast year

Milestone Three: Develop a local climate action plan

Milestone Four: Implement the climate action plan

Milestone Five: Monitor progress and report results

Figure 1.1 The Five-Milestone Process



1.3 Climate Change Mitigation Activities in California

Beginning in 2005, the State of California has responded to growing concerns over the effects of climate change by adopting a comprehensive approach to addressing emissions in the public and private sectors. This approach was officially initiated with the passage of the Global Warming Solutions Act of 2006 (AB 32), which required the state to reduce its greenhouse gas emissions to 1990 levels by 2020. It also required the California Air Resources Board (ARB) to regularly inventory emissions at the state level and to create a plan for reducing these emissions. The bill authorized ARB to adopt and enforce regulations targeted at greenhouse gas emissions reductions in the public and private sectors.

The resulting AB 32 Scoping Plan was adopted by ARB in December 2008. It established the following measures that the State will take to meet the greenhouse gas emissions reduction targets:

- Develop a California cap-and-trade program
- Expand energy efficiency programs
- Establish and seek to achieve reduction targets for transportation-related GHG emissions
- Support implementation of a high-speed rail system
- Expand the use of green building practices
- Increase waste diversion, composting, and commercial recycling toward zero-waste
- Continue water efficiency programs and use cleaner energy sources to move and treat water

- Implement the Million Solar Roofs Programs
- Achieve a statewide renewable energy mix of 33 percent
- Develop and adopt the low-carbon fuel standard
- Implement vehicle efficiency measures for light-, medium-, and heavy-duty vehicles
- Adopt measures to reduce high global warming potential gases
- Reduce methane emissions at landfills
- Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation
- Capture of methane through use of manure digester systems at dairies

Other measures taken by the state have included mandating stronger vehicle emissions standards (AB 1493, 2002), establishing a low-carbon fuel standard (EO # S-01-07, 2007), mandating a climate adaptation plan for the state (S-EO # 13-08, 2008), establishing a Green Collar Job Council, and establishing a renewable energy portfolio standard for power generation or purchase in the state. The state also has made a number of changes that will likely have potentially large effects on local governments:

- SB 97 (2007) required the Office of Planning and Research to create greenhouse gas planning guidelines for the California Environmental Quality Act (CEQA). In addition, ARB is tasked with creating energy-use and transportation thresholds in CEQA reviews, which may require local governments to account for greenhouse gas emissions when reviewing project applications.
- AB 811 (2007) authorized all local governments in California to establish special districts that can be used to finance solar or other renewable energy improvements to homes and businesses in their jurisdiction.
- SB 732 (2008) established a Strategic Growth Council charged with coordinating policies across state agencies to support a unified vision for land use development in the state. This vision will serve as a reference point for local land use policies.
- SB 375 (2008) mandated the creation of regional sustainable community strategies (SCS) by regional planning agencies. The SCS links regional housing and transportation planning processes in an attempt to meet regional greenhouse gas emissions targets.

1.4 Climate Change Mitigation Activities in San Carlos

The City of San Carlos has teamed up with several groups to advance climate protection and sustainability, including the San Carlos Chamber of Commerce, the South Bayside Waste Management Authority (SBWMA) and San Carlos Green (a community based program focused on green activities) to bring these programs and efforts to a city-wide audience of residents and businesses. The City Staff handles green programs at the City Government, the Chamber of Commerce works with the business community, the SBWMA offers solid waste, recycling and green

programs to San Carlos residents and businesses and San Carlos Green works with San Carlos residents. Below is a summary of City Green Programs, please also refer to Appendix F for the 2009 City of San Carlos Annual Report to Council on Green Programs and Climate Change.

City Programs

The City of San Carlos was an early leader in several green program areas including the recycling of office paper, LED traffic signal lights, re-lamping of City Hall to reduce energy usage and costs and an award winning photovoltaic installation at the City Corporation Yard on Bransten Road. In the past year, the City teamed up with the South Bayside Waste Management Authority (SBWMA) to give away compost to San Carlos residents, to conduct an



eWaste event in July and October 2008 with another planned in August 2009, and to pilot a Residential Battery and Cell Phone Curbside Recycling Program that was so successful that it is now in place for residents at all 12 SBWMA member agencies. In March 2009, the City started another pilot program with the SBWMA that will provide weekly residential pickup of Food Scraps, Organics & Yard Clippings for all residential customers.

City Council Approval of Green Programs and Climate Protection Work

On May 14, 2007, the City Council considered a report from City Staff to expand the City's Green Programs and to launch an effort to work on climate change and climate protection. It included a Community Solar Discount Program in partnership with Solar City, San Carlos Green, Joint Venture: Silicon Valley Climate Protection Initiative, San Mateo County Green Business Program and other regional programs in this area. The City Council directed the City staff to move ahead with these recommendations and expanded the City's Green and Climate Programs. Since that time, the City's Assistant City Manager & Green Programs Coordinator has provided an Annual Green Programs & Climate Change report to the City Council outlining additional initiatives in these areas.

Certified Green Businesses in San Carlos

At the invitation of San Mateo County Supervisor Mark Church and the County's Recycle Works.Org Division, San Carlos became one of 6 cities in San Mateo County to pilot this County's participation in the Bay Area Green Business Program 18 months ago.

The program, which started 10 years ago in Alameda County is sponsored by the Association of Bay Area Governments (ABAG) and encourages local businesses of all sizes to adopt Green Business Practices and then to

participate in a certification process. Certification involves completing an 11 page checklist, working with the City and inspections by local utilities and regulators and the County to insure compliance with Green standards. Certified Green Businesses receive a Green Business Program window sticker for their firm, Green Business artwork for their web site and a listing in a Bay Area Green Business Guide that now tops 1,000 firms. San Carlos to now has 21 Certified Green Businesses, the largest number in San Mateo County. This demonstrates the business community's commitment to taking steps to participate in the City's Green Programs.

San Carlos Businesses and the Chamber of Commerce Green Task Force

Businesses in San Carlos have been active in Green Programs in cooperation with the City. The San Carlos Chamber of Commerce is playing a leading role through their creation of a Green Business Task Force. The Task Force meets regularly and is providing information and profiles of leading businesses in San Carlos in their newsletter. The Chamber also has held two community-wide eWaste events in San Carlos. The Chamber also aids the City in identifying local firms to participate in the Bay Area Green Business Certification Program and has held two of their Pulse of Business monthly programs on adding green practices to your company as well as a recent Green Briefing and Trade Show at the San Carlos Library for businesses in San Carlos and throughout Northern San Mateo County.

Resident Programs and San Carlos Green

San Carlos residents are a key part of green programs and climate protection in San Carlos. A group of participants from the Enhancing the City of Good Living effort have formed a community based group named San Carlos Green to spearhead a number of the residential efforts in this area including the Solar City Discount Solar Program and the Yahoo Greenest City Contest. San Carlos Green is active with a number of green and climate initiatives in the community.

Countywide and Regional Efforts

Recognizing the size and scope of the challenge, the City of San Carlos was a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative. Today that effort has grown to include all 42 cities and counties in Silicon Valley. The City has also joined and participated in several related efforts including work by ICLEI, the Bay Area Air Quality Management District, the Association of Bay Area Governments (ABAG), the Institute of Local Self Government (ILSG) and the League of California Cities.

Demonstrating Success

The City Staff brings reports on the City's work in the areas of green programs and climate protection to the City Council on a periodic basis including reports to the City Council, the Solar City Community Solar Discount Program (June - August 2007) and recognition of the San Carlos businesses that have earned a Green Certification

in the Bay Area Green Business Program. The most recent report to the City Council was the third in a series that celebrated the program's 1 Year Anniversary and highlighted plans for the coming year.

1.5 The Silicon Valley Climate Protection Partnership

The Silicon Valley Climate Protection Partnership is a joint effort between Joint Venture: Silicon Valley Network (JV:SVN); Sustainable Silicon Valley (SSV); local governments in San Mateo, Santa Clara and Santa Cruz counties (hereby referred to as the "Silicon Valley area"); and ICLEI. The Partnership was initiated in 2008 to provide a solid regional platform for local governments to follow ICLEI's Five-Milestone process (described in Section 1.2), as well as a shared learning experience.

In early 2008, JV:SVN contracted with ICLEI to conduct government operations emissions inventories for participating local governments, using the standards outlined in the then soon-to-be-released Local Government Operations Protocol (LGOP—see Appendix A for details). For this project, 27 local governments have signed on to this contract. SSV joined the Partnership to provide additional educational and other services to facilitate more rapid progress by participating governments through the Five Milestones. While ICLEI created these inventories concurrently using the same tools and methods, each inventory was conducted independently using data specific to each local government's operations. For this reason, inventories from different jurisdictions will involve different sources of data and emissions calculation methods.

Alongside the activities of the Partnership, JV:SVN and SSV have been facilitating regional climate dialogues to further emissions reductions goals in the Silicon Valley area. JV:SVN supports the work of the Climate Protection Task Force, a group that includes staff members from 44 jurisdictions in the Silicon Valley area, including cities, counties, and special districts. In this neutral forum, the partners learn from each other and from expert guests about climate protection programs. They then work to develop effective, collaborative programs for the reduction of greenhouse gas emissions from public agency operations. SSV holds quarterly conferences and monthly meetings that discuss specific approaches to addressing climate change, including the pros and cons of regional climate planning. SSV also puts out annual reports highlighting successes of businesses and local governments that have voluntarily pledged to set and work toward their own carbon dioxide reduction goals. JV:SVN and SSV, along with ICLEI, the San Mateo City/County Association of Governments, and the Bay Area Air Quality Management District⁹, have dramatically pushed forward the pace and scale of climate actions by local governments in the Silicon Valley area.

⁹ C/CAG and the Air Quality District have provided funding which have allowed a number of these inventories to occur and have been strong players in pushing forward local and regional actions on climate change.

Section Two: Methodology





Methodology

This greenhouse gas emissions inventory follows the standard methodology outlined in LGOP, which was adopted in 2008 by ARB and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. By participating in the Silicon Valley Climate Protection Partnership, jurisdiction has the opportunity to be one of the first in the nation to follow LGOP when inventorying emissions from government operations.

This chapter outlines the basic methodology utilized in the development of this inventory to provide clarity on how the inventory results were reported. Specifically, this section reviews:

- What greenhouse gases were measured in this inventory.
- What general methods were used to estimate emissions.
- How emissions estimates can be reported (the scopes framework, roll-up numbers).
- How emissions estimates were reported in this inventory.

A more detailed account of LGOP and the methodology used in this inventory can be found in Appendices A and B.

2.1 Greenhouse Gases

According to LGOP, local governments should assess emissions of all six internationally recognized greenhouse gases regulated under the Kyoto Protocol. These gases are outlined in Table 2.1, which includes the sources of these gases and their global warming potential (GWP).¹⁰

¹⁰ Global warming potential (GWP) is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide.

Table 2.1 Greenhouse Gases

Gas	Chemical Formula	Activity	Global Warming Potential (CO ₂ e)
Carbon Dioxide	CO ₂	Combustion	1
Methane	CH ₄	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N ₂ O	Combustion, Wastewater Treatment	310
Hydrofluorocarbons	Various	Leaked Refrigerants, Fire Suppressants	12–11,700
Perfluorocarbons	Various	Aluminum Production, Semiconductor Manufacturing, HVAC Equipment Manufacturing	6,500–9,200
Sulfur Hexafluoride	SF ₆	Transmission and Distribution of Power	23,900

2.2 Calculating Emissions

LGOP outlines specific methods for quantifying emissions from local government activities. What methods a local government can use to quantify emissions vary largely by how it gathers data, and therefore what data were available. In general, emissions can be quantified in two ways.

1. Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions from a monitoring system. Emissions measured this way may include those emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This method is the most accurate way of inventorying emissions from a given source, but is generally available for only a few sources of emissions.

2. Calculation-based methodologies refer to an estimate of emissions calculated based upon some measurable activity data and emission factors. Table 2.2 demonstrates some examples of common emissions calculations in this report. For a detailed explanation of the methods and emissions factors used in this inventory, see Appendix B.

Table 2.2 Basic Emissions Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kilowatt hours)	CO ₂ emitted/kWh	CO ₂ emitted
Natural Gas Consumption (therms)	CO ₂ emitted/therm	CO ₂ emitted
Gasoline/Diesel Consumption (gallons)	CO ₂ emitted /gallon	CO ₂ emitted
Waste Generated by Government Operations (tons)	CH ₄ emitted/ton of waste	CH ₄ emitted

2.3 Reporting Emissions

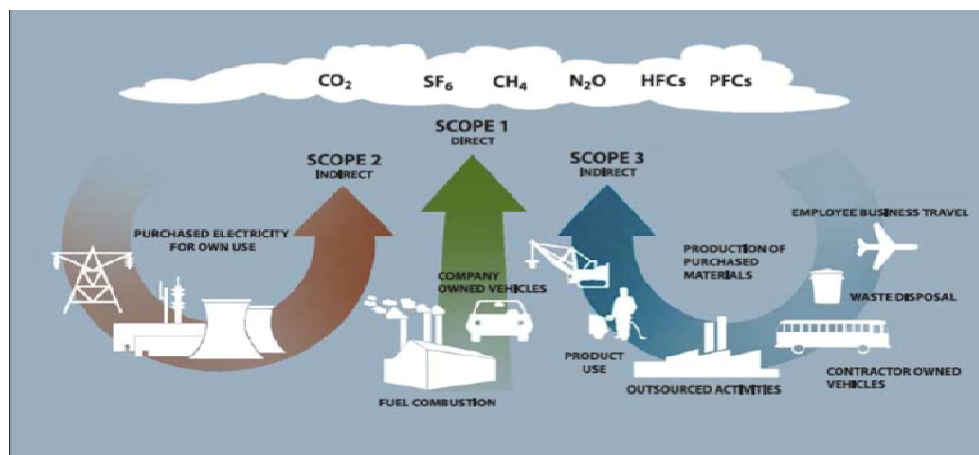
LGOP provides two reporting frameworks: reporting by scope and reporting by sector. This section defines the two reporting frameworks and discusses how they are used in this inventory. It also discusses the concept of “rolling up” emissions into a single number. This can assist local governments in communicating the results of the inventory and using the inventory to formulate emissions reductions policies.

2.3.1 The Scopes Framework

For local government operations, LGOP categorizes emissions according to what degree of control local governments have over the emissions sources. These categorizations (developed by the World Resources Institute and the World Business Council for Sustainable Development) are called *emissions scopes*. The scopes framework helps local governments to:

- Determine which emissions should be inventoried.
- Organize emissions by degree of control and therefore the potential for reduction of these emissions.
- Avoid “double counting” of emissions, i.e., summing up of different emissions sources that may result in reporting these emissions twice.

Figure 2.1 Emissions Scopes



Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

The emissions scopes are defined as follows:

Scope 1: Direct emissions from sources within a local government’s operations that it owns and/or controls. This includes stationary combustion to produce electricity, steam, heat, and power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions that result from production, processing, transmission, storage and use of fuels; leaked refrigerants; and other sources.

Scope 2: Indirect emissions associated with the consumption of electricity or steam that is purchased from an outside utility.

Scope 3: All other emissions sources that hold policy relevance to the local government that can be measured and reported. This includes all indirect emissions not covered in Scope 2 that occur as a result of activities within the operations of the local government. Sources over which the local government does not have any financial or operational control over would be accounted for here. Scope 3 emission sources include (but are not limited to) tailpipe emissions from employee commutes, employee business travel, and emissions resulting from the decomposition of government-generated solid waste.

Table 2.3 Inventoried Emission Sources by Scope¹¹

Scope 1	Scope 2	Scope 3
Fuel consumed to heat/cool facilities	Purchased electricity consumed by facilities	Solid waste generated by government operations
Fuel consumed for vehicles and mobile equipment	Purchased electricity consumed by electric vehicles	Fuel consumed for employee vehicles used for commuting
Fuel consumed to generate electricity	Purchased steam for heating or cooling facilities	
Leaked refrigerants from facilities and vehicles		
Leaked/deployed fire suppressants		
Wastewater decomposition and treatment at a municipal wastewater treatment plant		
Solid waste in government landfills		

2.3.2 Double Counting and Rolling Up Scopes

Many local governments find it useful for public awareness and policymaking to use a single number (a “roll-up” number) to represent emissions in its reports, target setting, and action plan. A roll-up number allows local governments to determine the relative proportions of emissions from various sectors (e.g., 30 percent of rolled up emissions came from the vehicle fleet). This can help policymakers and staff identify priority actions for reducing emissions from their operations.

For these reasons, this report includes a roll-up number as the basis of the emissions analysis in this inventory. This roll-up number is composed of direct emissions (Scope 1), all emissions from purchased electricity (Scope 2), and indirect emissions from employee commutes and government-generated solid waste (Scope 3).

¹¹ This only represents a list of emissions that were inventoried for the Silicon Valley Climate Protection Partnership inventories. This is not meant to be a complete list of all emissions that can be inventoried in a government operations inventory.

While this report uses a standard roll-up number, these numbers should be used with caution, as they can be problematic for three reasons:

First, a roll-up number does not represent all emissions from San Carlos' operations, only a summation of inventoried emissions using available estimation methods. Reporting a roll-up number can be misleading and encourage citizens, staff, and policymakers to think of this number as the local government's "total" emissions. Therefore, when communicating a roll-up number it is important to represent it only as a sum of inventoried emissions, not as a comprehensive total.

Second, rolling up emissions may not simply involve adding emissions from all sectors, as emissions from different scopes can be double-counted when they are reported as one number. For example, if a local government operates a municipal utility that provides electricity to government facilities, these are emissions from both the power generation and facilities sectors. If these sectors are rolled up into a single number, these emissions are double counted, or reported twice. For these reasons, it is important to be cautious when creating a roll-up number to avoid double counting; the roll-up number used in this report was created specifically to avoid any possible double counting.

Third, local governments often wish to compare their emissions to those of other local governments. But it is very difficult to use a roll-up number as a common measure between local governments, for a number of reasons. First, as of now there is no national or international standard for reporting emissions as a single roll-up number. In addition, local governments provide different services to their citizens, and the scale of the services (and thus the emissions) is highly dependent upon the size of the jurisdiction. For these reasons, comparisons between local government roll-up numbers should not be made without significant analysis of the basis of the roll-up number and the services provided by the local governments being compared.

2.3.3 Emissions Sectors

ICLEI recommends that local governments examine their emissions in the context of the part of their operations (sector) that is responsible for those emissions. This is helpful from a policy perspective, and will assist local governments in formulating sector-specific reduction measures and climate action plans. This inventory uses LGOP sectors as a main reporting framework, including the following sectors:

- Buildings and other facilities
- Streetlights, traffic signals, and other public lighting
- Water delivery facilities
- Vehicle fleet and mobile equipment
- Government-generated solid waste
- Emissions from employee commutes

Section Three: Inventory Results





Inventory Results

This chapter provides a detailed description of the City of San Carlos' emissions from government operations in 2005, rolling up and comparing emissions across sectors and sources as appropriate. This chapter also provides details on the greenhouse gas emissions from each sector, including a breakdown of emissions types and, where possible, an analysis of emissions by department. This information identifies more specific sources of emissions (such as a particular building) that can help staff and policymakers best target emissions reduction activities in the future.

For a report of emissions by scope, and a detailed description of the methodology and emission factors used in calculating the emissions from the City's operations, please see Appendix B: LGOP Standard Report.

In 2005, the City of San Carlos' direct emissions, emissions from electricity consumption and select indirect sources totaled 1,743 metric tons of CO₂e.¹² In this report, this number is the basis for comparing emissions across sectors and sources (fuel types), and is the aggregate of all emissions estimates used in this inventory.

3.1 Summary by Sector

Reporting emissions by sector provides a useful way to understand the sources of the City of San Carlos' emissions. By better understanding the relative scale of emissions from each of the sectors, the City can more effectively focus emissions reductions strategies to achieve the greatest emissions reductions.¹³

¹² This number represents a roll-up of emissions, and is not intended to represent a complete picture of emissions from San Carlos' government operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total. See section 2.3.2 for more detail.

¹³ The sectors with the largest scale of emissions do not necessarily represent the best opportunity for emissions reductions. Cost, administration, and other concerns may affect San Carlos' ability to reduce emissions from any one sector.

Figure 3.1 2005 Government Operations Emissions by Sector

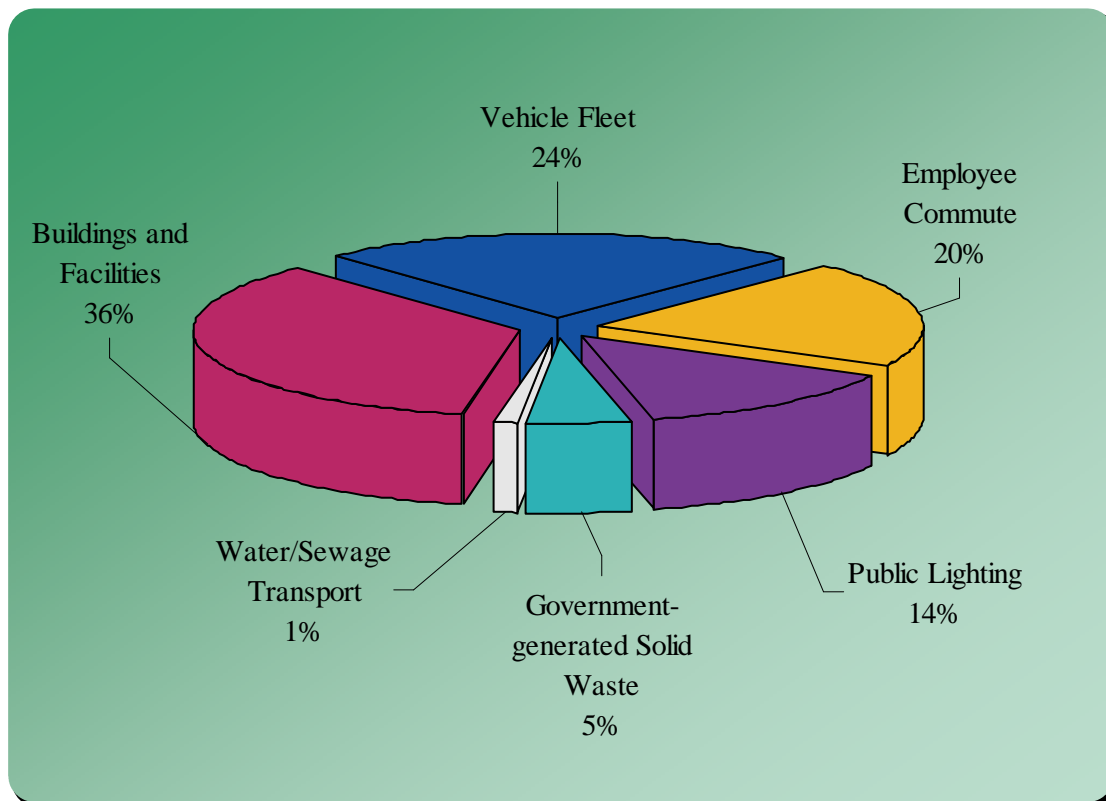


Table 3.1 2005 Government Operations Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO ₂ e)
Buildings and Facilities	613
Vehicle Fleet	425
Employee Commute	353
Public Lighting	241
Government-generated Solid Waste	93
Water/Sewage Transport	18

As visible in Figure 3.1 and Table 3.1, buildings and facilities were the largest emitters of greenhouse gases (613 metric tons CO₂e) in 2005. Emissions from the vehicle fleet produced the second highest quantity of emissions (24 percent), resulting in 425 metric tons of CO₂e. The City of San Carlos' employee commute produced 353 metric tons of CO₂e (20 percent) of total emissions, with the remainder coming from public lighting (241 metric tons CO₂e), government-generated waste (93 metric tons of CO₂e), and water delivery (18 metric tons of CO₂e).

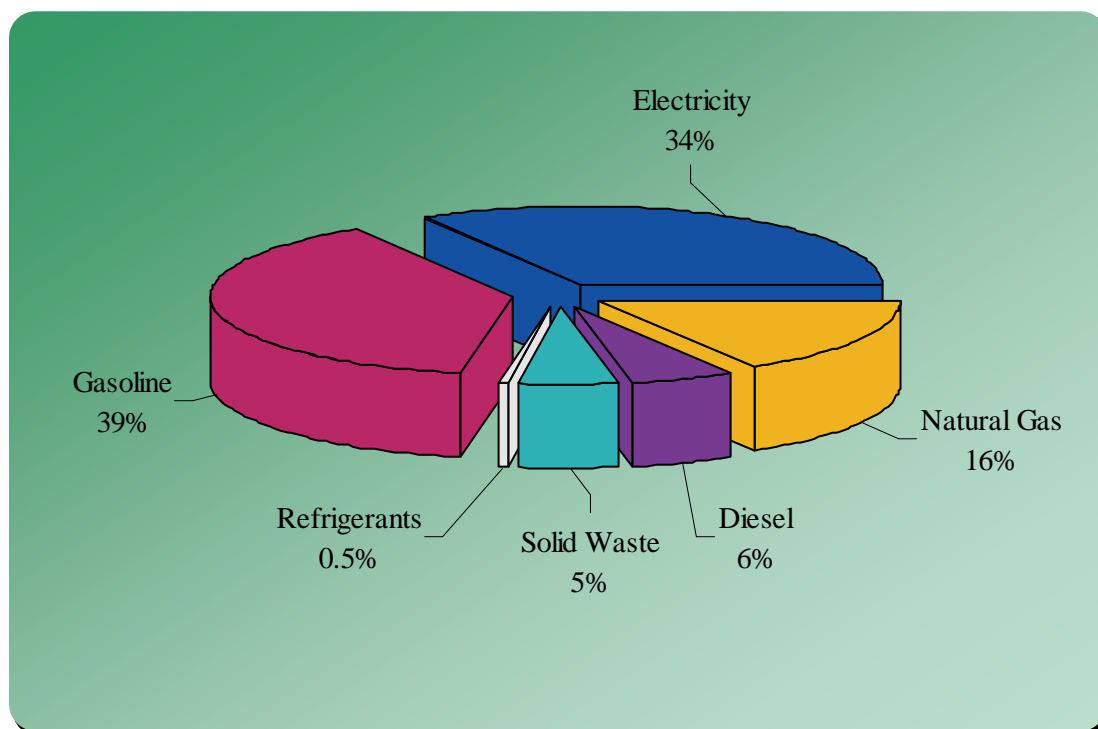
3.2 Summary by Source

When considering how to reduce emissions, it is helpful to look not only at which sectors are generating emissions, but also at the specific raw resources and materials (gasoline, diesel, electricity, natural gas, solid waste, etc.) whose use and generation directly result in the release of greenhouse gases. This analysis can help target resource management in a way that will successfully reduce greenhouse gas emissions. Table 3.2 and Figure 3.2 provide a summary of San Carlos government operations 2005 greenhouse gas emissions by fuel type or material.

Table 3.2 2005 Government Operations Emissions by Source

Fuel/Source	Greenhouse Gas Emissions (metric tons CO ₂ e)
Gasoline	671
Electricity	588
Natural Gas	284
Diesel	99
Government-Generated Solid Waste	93
Refrigerants	8

Figure 3.2 2005 Government Operations Emissions by Source



3.3 Summary of Energy-Related Costs

In addition to tracking energy consumption and emissions per sector, ICLEI has calculated the basic energy costs of various government operations. During 2005, the City of San Carlos spent approximately \$523,419 on energy (electricity, natural gas, gasoline, and diesel). Sixty-four percent of these energy expenses (\$335,255) resulted from electricity consumption, and 11 percent (\$58,036) from natural gas purchases from PG&E and ABAG Power. Fuel purchases (gasoline and diesel) for the vehicle fleet and mobile equipment totaled \$130,127 or 25 percent of total costs included in this inventory. In addition to these direct costs, the City of San Carlos received waste disposal service in 2005 with an estimated value of \$58,139.¹⁴ Beyond reducing harmful greenhouse gases, any future reductions in energy use will have the potential to reduce these costs, enabling the City to reallocate limited funds toward other municipal services or create a revolving energy loan fund to support future climate protection activities.

Table 3.3 2005 Energy Costs by Sector

Sector	Costs (\$)
Buildings and Facilities	\$260,556
Vehicle Fleet	\$130,127
Public Lighting	\$122,501
Water / Sewage	\$10,234
TOTAL	\$523,419

3.4 Detailed Sector Analyses

3.4.1 Buildings and Other Facilities

Through their use of energy for heating, cooling, lighting, and other purposes, buildings and other facilities operated by local governments constitute a significant amount of their greenhouse gas emissions. Facility operations contribute to greenhouse gas emissions in two major ways. First, facilities consume electricity and fuels such as natural gas, and this consumption contributes the majority of greenhouse gas emissions from facilities. In addition, fire suppression, air conditioning, and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other greenhouse gases when these systems leak refrigerants or fire suppressants.

In 2005, the operation of the City of San Carlos' facilities produced approximately 613 metric tons of CO₂e from the consumption of electricity and natural gas.¹⁵ Table 3.4 shows estimated energy use and costs associated with the

¹⁴ While, in 2005, the City did not pay directly for waste hauling services (these costs were—and are currently—bundled under the franchise agreement with Allied Waste through the SBWMA and passed on to tax-payers), the monetary value of these services has been quantified to help inform policy decisions.

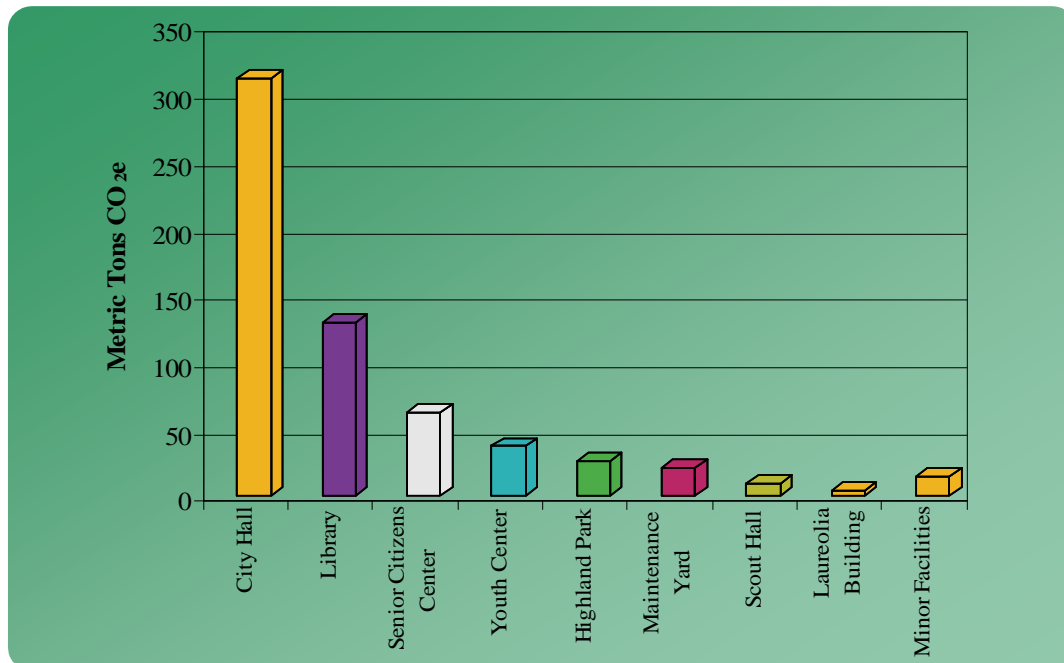
¹⁵ In 2005, San Carlos facilities also generated fugitive refrigerant emissions with global warming potential. The particular refrigerant used in City buildings was the ozone-depleting gas R-22, which is monitored separately under the Montreal

activities that generated these emissions, and Figure 3.3 depicts 2005 emissions per facility. Of total facility emissions, 54 percent came from the consumption of electricity and 46 percent came from the combustion of natural gas (see Figure 3.4). The City spent approximately \$260,556 in 2005 on these sources of energy. In developing emissions reduction policy, the City is encouraged to address all facilities, however it is important to note that in 2005 over 70 percent of facility emissions came from the City Hall and the City Library alone (Table 3.4).

Table 3.4: Energy Use and Emissions from Facilities

Facility	Greenhouse Gas Emissions (metric tons CO ₂ e)	Percent Emissions of All Facilities ¹⁶	Electricity Use (kWh)	Natural Gas Use (therms)	Total Energy Cost
City Hall	312	51%	711,600	28,640	\$127,390
Library	130	21%	293,040	12,042	\$54,261
Senior Citizens Center	62	10%	153,600	5,169	\$29,156
Youth Center	37	6%	88,160	3,224	\$17,918
Highland Park	25	4%	113,600	0	\$13,061
Maintenance Yard	21	3%	21,120	3,011	\$3,064
Scout Hall	9	1%	27,694	536	\$4,738
Laureolia Building	4	1%	19,294	0	\$2,396
Minor Facilities	14	2%	46,837	648	\$8,572
TOTAL	613	100%	1,474,945	53,270	\$260,556

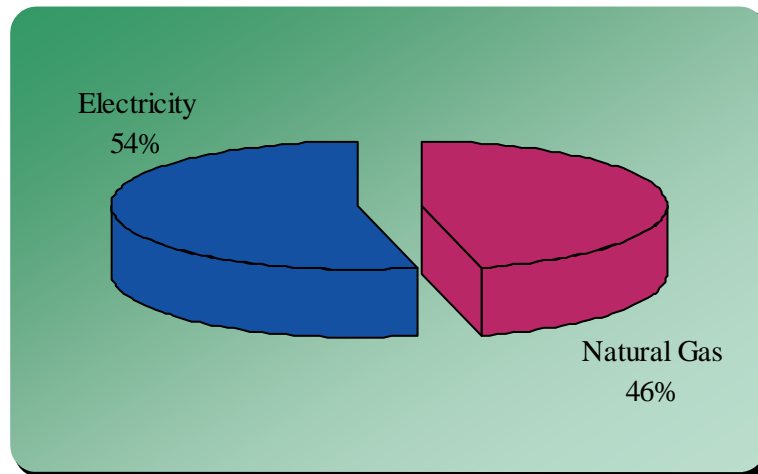
Figure 3.3: Emissions from Facilities



Protocol. Per LGOP guidelines, these emissions are excluded from the main body of this accounting, however the CO₂ equivalency and quantity of these emissions are recorded in the LGOP Standard Report (Appendix B).

¹⁶ Estimated emissions from leaked refrigerants and fire suppressants were not reported by facility and therefore are not included in the total emissions used to calculate these percentages.

Figure 3.4: Emissions from Facilities by Source



3.4.2 Streetlights, Traffic Signals, and Other Public Lighting

Like most local governments, San Carlos operates a range of public lighting, from traffic signals and controllers to streetlights and other outdoor lighting. Electricity consumed in the operation of this infrastructure is a significant source of greenhouse gas emissions.

In 2005, public lighting in San Carlos consumed a total of 1,077,512 kilowatt hours of electricity, producing approximately 241 metric tons CO₂e. Table 3.5 depicts 2005 emissions per lighting type and estimated electricity consumption and costs associated with the activities that generated these emissions. The City spent approximately \$122,501 in 2005 on the fuels and electricity that were the cause of these emissions.

Table 3.5: Energy Use and Emissions from Public Lighting

Source	Greenhouse Gas Emissions (metric tons CO ₂ e)	Percent Emissions of All Lighting	Electricity Use (kWh)	Cost
Streetlights	198	82%	883,734	\$95,118
Traffic Signals/Controllers	27	11%	120,066	\$17,951
Other Outdoor Lighting	16	7%	73,712	\$9,432
TOTAL	241	100%	1,077,512	\$122,501

3.4.3 Water Transport

This section addresses any equipment used for the distribution of water or stormwater.¹⁷ Typical systems included in this section are water pumps/lifts and sprinkler and other irrigation controls. The City of San Carlos operates a range of water transport equipment, including water pumps and irrigation/sprinkler systems. Electricity consumption is the most significant source of greenhouse gas emissions from the operation of San Carlos' water transport equipment, with a minor contribution from natural gas use as well.

In 2005, the operation of the City's water transport equipment produced approximately 18 metric tons of CO₂e from the above sources. Table 3.6 depicts 2005 emissions per equipment type and shows estimated activities and costs associated with the operation of this equipment. San Carlos spent approximately \$10,234 in 2005 on the fuels and electricity that were the cause of these emissions.

Table 3.6: Energy Use and Emissions from Water Transport Equipment

Source	Greenhouse Gas Emissions (metric tons CO ₂ e)	Percent Emissions of Water Transport Equipment	Electricity Use (kWh)	Natural Gas Use (therms)	Cost
Water Pumps	17	96%	74,156	84	\$9,611
Irrigation / Sprinkler Systems	1	4%	3,021	0	\$623
TOTAL	18	100%	77,177	84	\$10,234

3.4.4 Vehicle Fleet and Mobile Equipment

The majority of local governments use vehicles and other mobile equipment (such as: backhoes, lawn mowers, power washers, chainsaws, etc.) as an integral part of their daily operations—from maintenance trucks used for parks and recreation to police cruisers and fire trucks. These vehicles and equipment burn gasoline, diesel, and other fuels, which results in greenhouse gas emissions. In addition, vehicles with air conditioning or refrigeration equipment use refrigerants that can leak from the vehicle. Emissions from vehicles and mobile equipment compose a significant portion of emissions within most local governments.

In 2005, San Carlos emitted approximately 417 metric tons of CO₂e in the combustion of fuels to power the City's vehicle fleet and mobile equipment. Table 3.7 shows estimated costs associated with the activities that generated these emissions, and Figure 3.5 depicts 2005 emissions per department. The Police Department was the largest emitter of mobile emissions (45 percent), and the Fire Department produced the second highest quantity (20

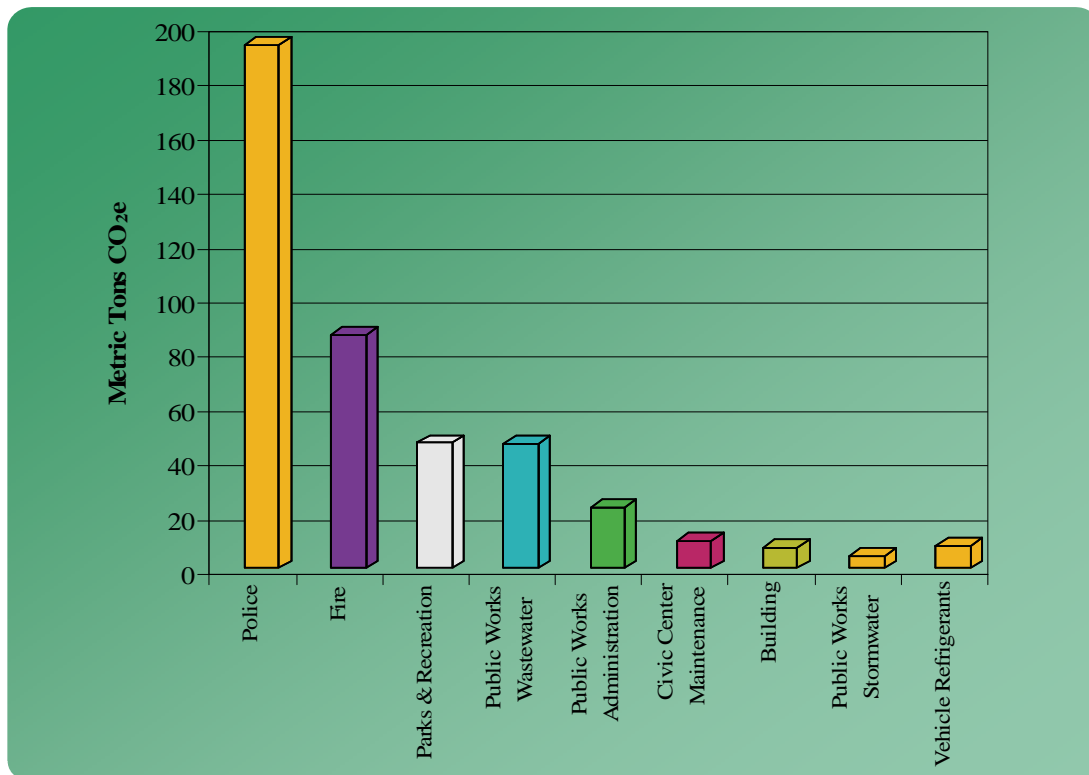
¹⁷ While equipment that transports water or stormwater may be managed separately in jurisdiction's operations, the types of equipment are similar, and therefore the ways to reduce emissions from this equipment, are similar. For this reason, this section groups equipment used for transporting water and wastewater.

percent). Seventy-five percent of fleet emissions stem from the use of gasoline, 43 percent from diesel consumption, and the remaining 2 percent from leaked refrigerants.¹⁸

Table 3.7: Vehicle Fleet and Mobile Equipment Emissions

Function	GHG Emissions (metric tons CO ₂ e)	Percent of All Mobile Emissions	Gasoline Consumption (gal)	Diesel Consumption (gal)	Cost (\$)
Police	193	45%	21,386	0	\$60,304
Fire	86	20%	2,424	6,341	\$26,791
Parks & Recreation	46	11%	4,855	241	\$14,595
Public Works Wastewater	46	11%	1,782	2,949	\$14,405
Public Works Administration	23	5%	2,267	201	\$6,949
Civic Center Maintenance	10	2%	1,156	0	\$3,236
Building	8	2%	866	0	\$2,469
Public Works Stormwater	5	1%	507	0	\$1,378
Vehicle Refrigerants	8	2%	0	0	n/a
TOTAL	425	100%	35,243	9,733	\$130,127

Figure 3.5: Emissions from Mobile Sources



¹⁸ The LGOP Alternative Method (Equipment Inventory and Refrigerant Use) was used to estimate emissions from leaked refrigerants. This amount is a significant overestimate but in line with LGOP methods.

3.4.5 Government-Generated Solid Waste

Many local government operations generate solid waste, much of which is eventually sent to a landfill. Typical sources of waste in local government operations include paper and food waste from offices and facilities, construction waste from public works, and plant debris from parks departments. Organic materials in government-generated solid waste (including paper, food scraps, plant debris, textiles, wood waste, etc.) generate methane as they decay in the anaerobic environment of a landfill. An estimated 75 percent of this methane is routinely captured via landfill gas collection systems;¹⁹ however, a portion escapes into the atmosphere, contributing to the greenhouse effect. As such, estimating emissions from waste generated by government operations is an important component of a comprehensive emissions inventory.

Inventorying emissions from government-generated solid waste is considered optional by LGOP for two reasons. First, the emissions do not result at the point of waste generation (as with fuel combustion), but often in a landfill located outside of the City's boundaries. In addition, the majority of emissions are not generated in the base year, but over a lengthy decomposition period. Since inventorying these emissions is considered optional, LGOP does not provide guidance on recommended methods for quantification. ICLEI therefore devised data collection and calculation methods based upon previous experience and national standards. See Appendix D for more information on quantifying emissions from government-generated solid waste.

It is estimated that the waste disposed by government facilities in 2005 will cumulatively produce 4.4 metric tons of methane gas, or 93 metric tons CO₂e. Please see Table 3.8 for a breakdown of emissions per facility.

Table 3.8: Emissions from Government-Generated Solid Waste

Source	Greenhouse Gas Emissions (metric tons CO ₂ e)	Estimated Landfilled Waste (Tons)
Miscellaneous Roll-Off	51	201
City Cans	16	65
1000 Bransten Rd.	8	32
San Carlos City Hall	5	20
San Carlos Library	5	20
San Carlos Youth Center	5	20
Adult Community Center	2	6
Laurel Street Park	0.4	2
TOTAL	93	367

¹⁹ This is a default methane collection rate per LGOP. This rate can vary from 0 to 99 percent based upon the presence and extent of a landfill gas collection system at the landfill/s where the waste is disposed. Most commonly, captured methane gas is flared into the atmosphere, which converts the methane gas to CO₂ and effectively negates the human-caused global warming impact of the methane. Increasingly, landfill methane is being used to power gas-fired turbines as a carbon-neutral means of generating electricity.

3.4.6 Employee Commute

Fuel combustion from employees commuting to work is another important emissions source from San Carlos' operations. Similar to San Carlos' vehicle fleet, personal employee vehicles use gasoline and other fuels which, when burned, generate greenhouse gas emissions. Emissions from employee commutes are considered optional to inventory by LGOP because the vehicles are owned and operated privately by the employees. However, LGOP encourages reporting these emissions because local governments can influence how their employees commute to work through incentives and commuting programs. For this reason, employee commute emissions were included in this report as an area where San Carlos could achieve significant reductions in greenhouse gases.

To calculate emissions, the City administered a survey to all of its employees regarding their commute patterns and preferences. ICLEI then extrapolated the results of the survey to represent emissions from all employees. See Appendix C for a detailed description of the survey and methods used to calculate emissions.

In 2005, employees commuting in vehicles to and from their jobs at the City of San Carlos emitted an estimated 353 metric tons of CO₂e. Table 3.9 shows estimated emissions and vehicle miles traveled for all San Carlos employees.

Table 3.9: Emissions from Employee Commute

	Greenhouse Gas Emissions (metric tons CO ₂ e)	Estimated Vehicle Miles Traveled to Work	Average Estimated Vehicle Miles Traveled to Work
All Employees (Estimated)	353	673,983	6,419

3.4.9.1 Employee Commute Indicators

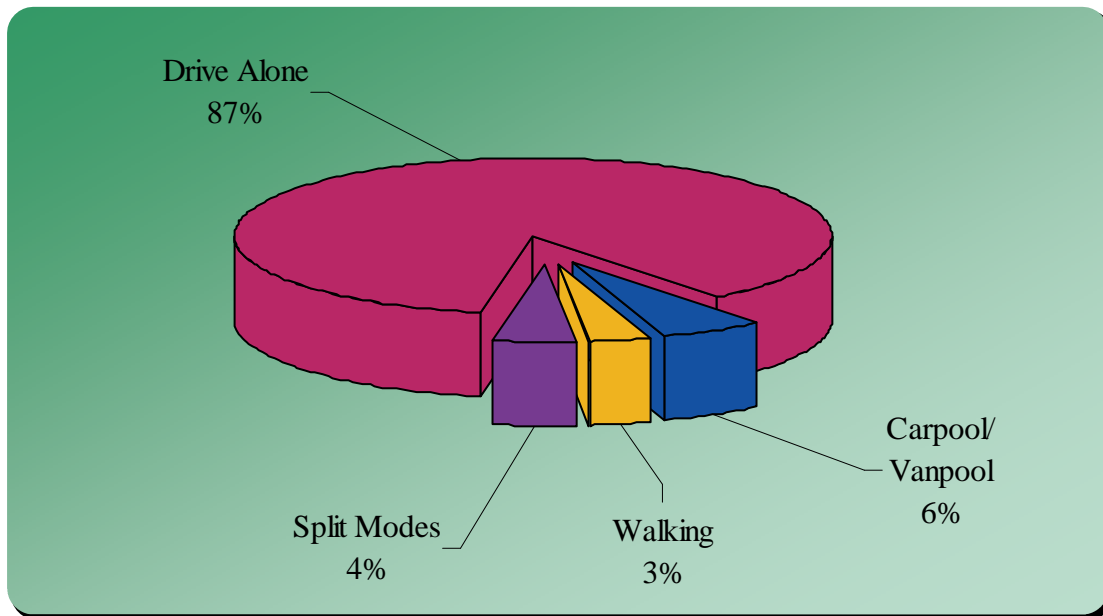
In addition to estimating greenhouse gas emissions from employee commutes, ICLEI examined other policy-relevant information that was extracted from the employee commute survey—in this way City staff can develop the most effective policies to reduce emissions from employee commutes. These measures often have co-benefits including increased productivity, reduced commute times and costs, and improvement in the quality of life for employees. No extrapolation was done with the following data; analyses were done using data from survey respondents only.

Commute Modes

In 2005, the majority (87 percent) of respondents commuted to work using single occupancy vehicles. Thirteen percent of all respondents used some form of alternative transportation (bicycle, public transit, carpool, etc) to commute to work with carpool/vanpool being the most used form of alternative transportation (6 percent of total

respondents), followed by split modes (4 percent of total respondents) and walking (3 percent of total respondents). See Figure 3.6 for an analysis of the most common commute mode for employees who responded to the survey.

Figure 3.6: Employee Commute Modes



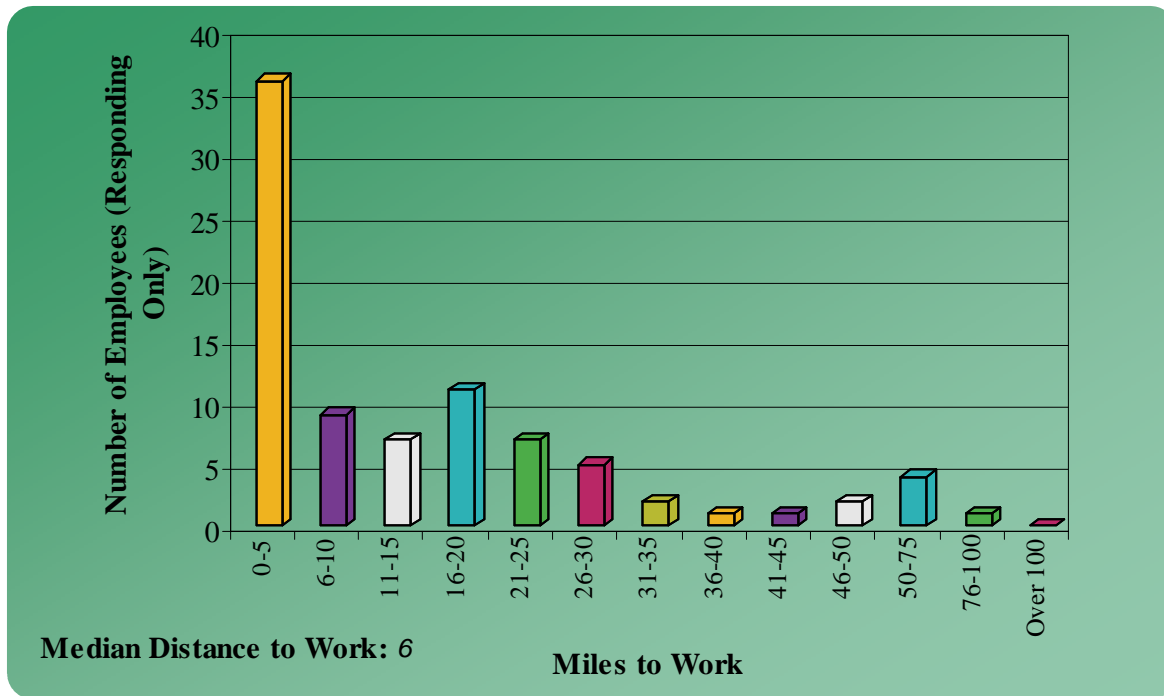
Commute Time and Costs

Table 3.10 shows the median time, cost, and distance of City employee commutes. Figure 3.7 shows that the majority of employees live within 6 miles, suggesting that there may be good opportunities for San Carlos to promote effective biking programs, carpooling/vanpooling and shuttle programs, or other alternative transit modes. According to the employee commute survey, 26 percent of employees were interested in public transit, while 21 percent were interested in carpooling and another 21 percent in biking (see Figure 3.8). By encouraging employees to utilize alternative modes of transit through incentives and City programs, San Carlos could not only reduce emissions, but save employees money and time—enhancing the benefits associated with working for the City.

Table 3.10: Median Distance and Time to Work and Cost of Employee Commute

	Median Time to Work (daily minutes)	Median Cost of Commute (weekly)	Median Distance To Work (daily miles)
Responding Employees	15	\$20	6

Figure 3.7: Employee Commute Distance to Work



Commuter Preferences

When asked if employees would consider taking a list of alternative transportation modes (see Figure 3.8), 26 percent of respondents indicated they would be interested in public transit, with carpooling as well as biking following by 21 percent. Five percent of respondents indicated that they had no interest in converting to an alternative mode of transportation (see Figure 3.8).

Despite employees' interest in public transit, only 34 percent of respondents indicated that there was a transit route available to and from work (Figure 3.9). This suggests that San Carlos can reduce emissions from commutes by working collaboratively with (BART, Caltrain, SamTrans, VTA) to provide better service for employees. Respondents also indicated that they would be interested in commute benefits such as (see Figure 3.10) a free public transit benefit (32 percent), a free/inexpensive shuttle service (29 percent), improved transit options (27 percent), vanpool/carpool incentives (25 percent), and a telecommuting program (24 percent).

Figure 3.8: Interest in Alternative Commute Modes

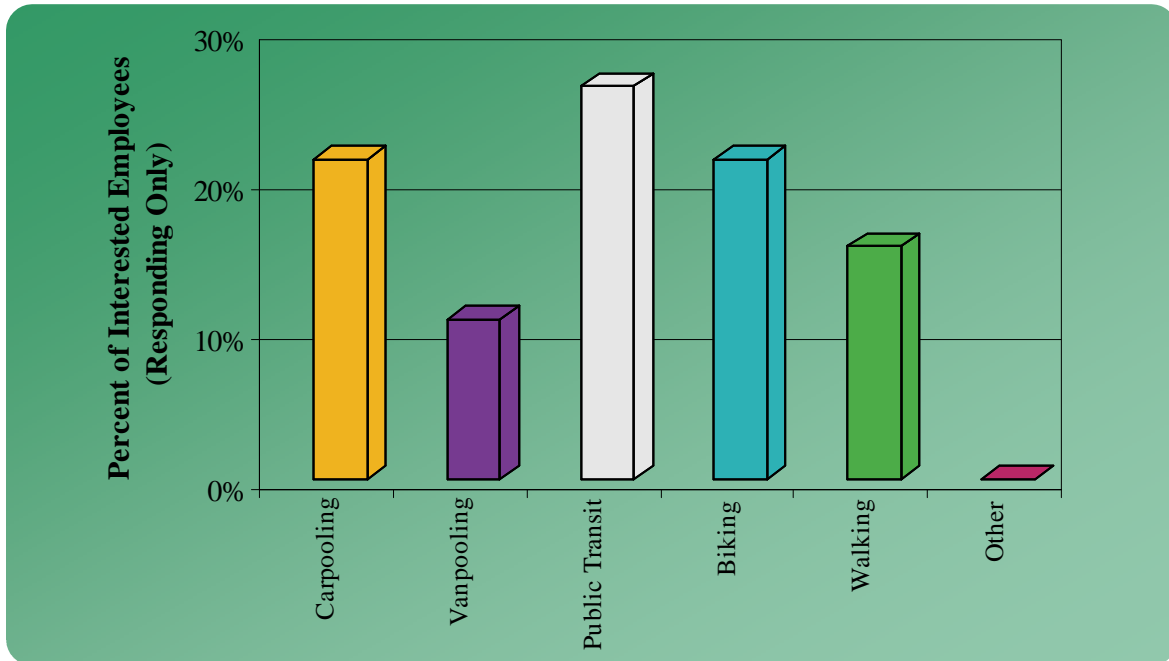


Figure 3.9: Employees with Available “Usable” Transit Route to Work

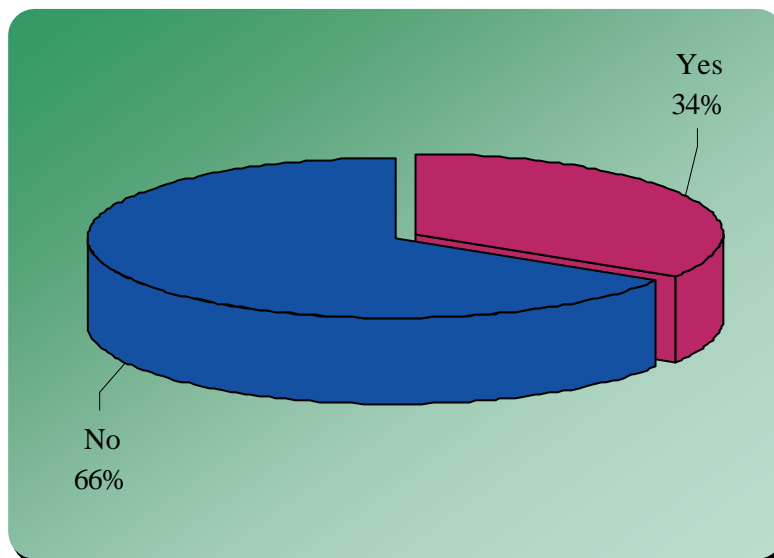
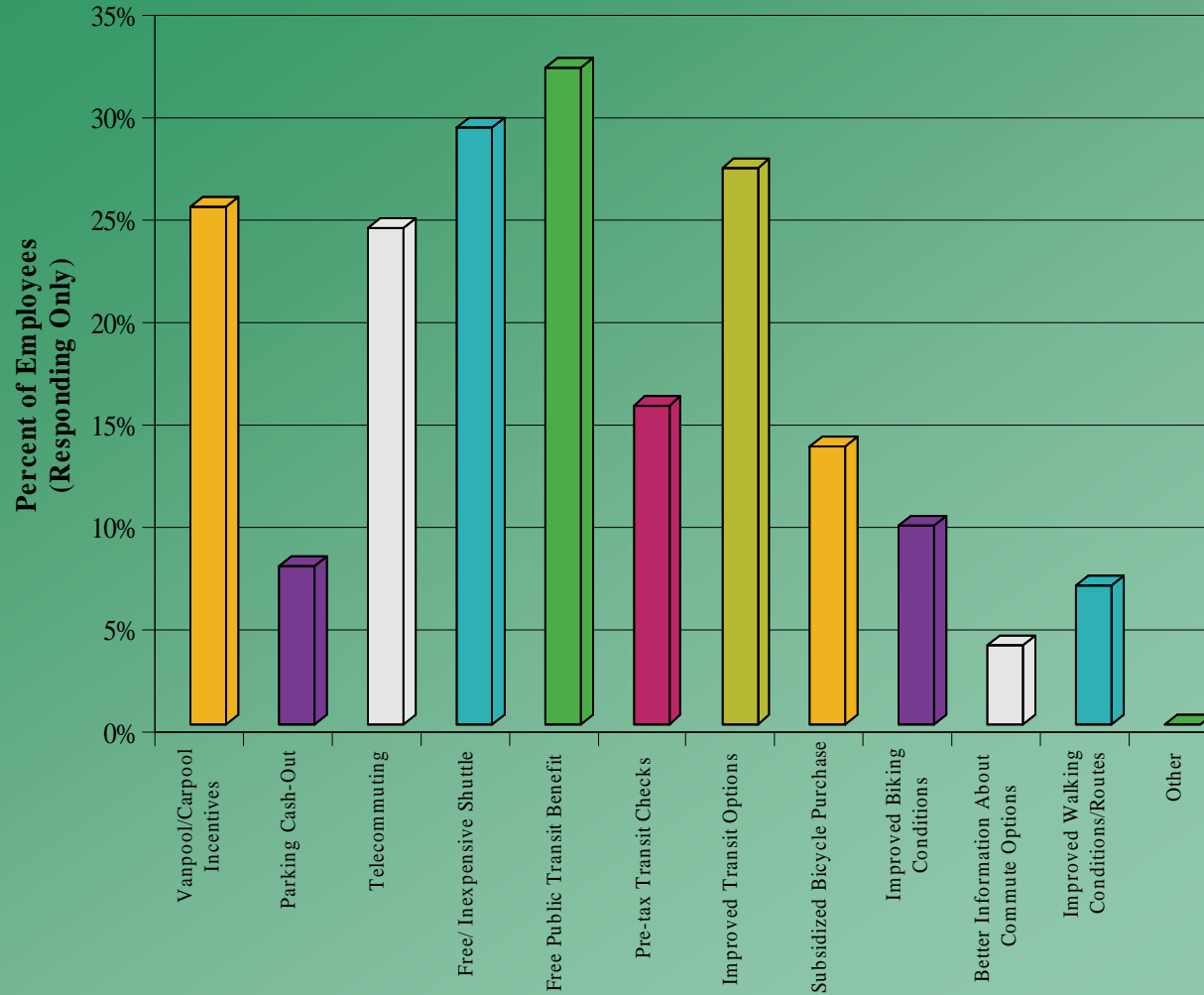


Figure 3.10: Employee Interest in Commute Benefits



Section Four: Conclusion





Conclusion

By committing itself to the Silicon Valley Climate Protection Partnership and through its previous actions on sustainability, the City of San Carlos has taken bold steps toward reducing its impacts on the environment. Staff and policymakers have chosen to take a leadership role in addressing climate change, and this leadership will allow San Carlos to make tough decisions to create and implement innovative approaches to reduce its emissions. With increasing guidance and support from the state and the federal governments, the City should be increasingly empowered to make the necessary changes to promote its vision for a more sustainable future.

This inventory provides an important foundation for San Carlos' comprehensive approach to reducing the greenhouse gas emissions from its operations. Specifically, this inventory serves to:

- Establish a baseline for setting emissions reductions targets.
- Identify the largest sources of emissions from local government operations.

This conclusion discusses the inventory as a baseline for emissions targets and suggests steps for the City to move forward to reduce emissions from its internal operations.

4.1 Toward Setting Emissions Reduction Targets

This inventory provides an emissions baseline against which the City can move forward to Milestone Two of ICLEI's Five-Milestone process—setting emissions reduction targets for its municipal operations. The greenhouse gas emissions reduction target represents the percentage by which San Carlos plans to reduce total greenhouse gas emissions in its government operations below base year levels by a chosen future target year. An example target might be a 30 percent reduction in emissions below 2005 levels by 2020. A target provides an objective toward

which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting global warming—demonstrating that the jurisdiction is serious about its commitment and systematic in its approach.

In selecting a target, it is important to strike a balance between scientific necessity, ambition, and what is realistically achievable. San Carlos will want to give itself enough time to implement chosen emissions reduction measures—but note that the farther out the target year is, the more that the City should pledge to reduce. ICLEI recommends that regardless of San Carlos’ chosen long-term emissions reduction target (e.g., 15-year, 40-year), it should establish interim targets for every two- to three-year period. Near-term targets facilitate additional support and accountability, and help to ensure continued momentum around San Carlos’ local climate protection efforts. To monitor the effectiveness of its programs, the City should plan to re-inventory its emissions at least every five years and more frequently if possible. See Appendix E for more information on how to re-inventory San Carlos’ emissions.

4.1.1 The Long-Term Goal

ICLEI recommends that the San Carlos’ near-term climate work should be guided by the long-term goal of reducing its emissions by 80 percent to 95 percent from the 2005 baseline level by the year 2050. By referencing a long-term goal that is in accordance with current scientific understanding, San Carlos can demonstrate that it intends to do its part towards addressing greenhouse gas emissions from its internal operations.

It is important to keep in mind that it will be next to impossible for local governments to reduce emissions by 80 to 95 percent without the assistance of state and federal policy changes that create new incentives and new sources of funding for emissions reduction projects and programs. However, in the next 15 years, there is much that local governments can do to reduce emissions independently. It is also important that the City works to reduce its emissions sooner, rather than later: the sooner a stable level of greenhouse gases in the atmosphere is achieved, the less likely we are to face some of the most dire climate change scenarios.

4.1.2 State of California Targets and Guidance

An integral component of the State of California’s climate approach has been establishing three core emissions reduction targets at the community level. While these targets are specific to the community-scale, they can be used to inform

Figure 4.1: California Greenhouse Gas Reduction Targets

On June 1, 2005, California Governor Schwarzenegger signed Executive Order S-3-05 establishing climate change emission reductions targets for the State of California. The California targets are an example of near-, mid- and long-term targets:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions to 80 percent below 1990 levels by 2050

emissions targets for government operations as well. Figure 4.1 highlights adopted emissions targets for the State. The AB 32 Scoping Plan also provides further guidance on establishing targets for local governments; specifically the Plan suggests creating an emissions reduction goal of 15 percent below “current” levels by 2020. This target has informed many local government’s emission reduction targets for municipal operations—most local governments in California with adopted targets have targets of 15 to 25 percent reductions under 2005 levels by 2020.

4.1.3 Department Targets

If possible, ICLEI recommends that San Carlos consider department-specific targets for each of the departments that generate emissions within its operations. This allows City staff to do a more in-depth analysis of what is achievable in each sector in the near, mid and long-term, and also provides encourages each department head to consider their department’s impact on the climate and institute a climate-conscious culture in its operations.

4.1.4 Monitoring Progress

ICLEI encourages the City of San Carlos to monitor its progress towards achieving specific emission reduction targets, by re-inventorying emissions every two to three years. A re-inventory (or monitoring inventory) will allow the City of San Carlos to identify any increases in building energy efficiency and conservation, advancements in waste reduction, improvements to the vehicle fleet, etc. This will not only help the City track it’s progress towards reaching its emission reduction targets, but also to critique the success of any projects or policies that may be implemented to reduce emissions. C/CAG and San Mateo County Energy Watch may be able to provide support in carrying out periodic inventory updates in the future. For further information on conducting a monitoring inventory please see Appendix E.

4.2 Creating an Emissions Reduction Strategy

This inventory identifies the major sources of emissions from San Carlos’ operations and, therefore, where staff and policymakers will need to target emissions reductions activities if they are to make significant progress toward adopted targets. For example, since electricity was a major source of emissions from San Carlos operations, it is possible that the City could meet near-term targets simply by implementing a few significant energy efficiency and conservation measures. In addition, medium-term targets could be met by focusing emissions reduction actions on the employee commute, the vehicle fleet, and renewable energy installation projects; and the long term (2050) target will not be achievable without major reductions in all of those sectors.

Given the results of the inventory, ICLEI recommends that San Carlos focus on the following tasks in order to significantly reduce emissions from its government operations:

- Offer increased public transit options; new shuttle, vanpool and carpool programs; and telecommuting scenarios to eligible employees to reduce emissions from employee commute;
- Conduct an energy audit of City buildings and improve energy efficiency where possible;
- Continue to convert the fleet to more fuel-efficient vehicles on a replacement basis (retire older, less efficient vehicles);
- Consider using a higher percentage of low-carbon fuels (such as biodiesel and ethanol) in all fleet vehicles;²⁰
- Consider purchasing electric vehicles;
- Replace streetlights and traffic signals with more energy efficient LED models;
- Consider installing renewable energy technologies, such as solar, wind or micro-hydro (only after energy efficiency improvements have been made); and
- Increase waste diversion by developing reuse, composting and recycling efforts.

Using these strategies as a basis for a more detailed emissions reductions strategy, San Carlos should be able to reduce and reverse its impact upon global warming. In the process, it may also be able to improve the quality of its services, become more efficient with energy, and reduce long-term costs.

²⁰ A growing number of California local governments have developed biofuel production facilities (see <http://www.sfgreasecycle.org/>), by gathering waste vegetable and animal fats from local resources—such as restaurants. There is growing critique of the overall sustainability of biofuels that are sourced from crop-lands that would have otherwise been used for food production or would have remained virgin forest (South America). It is important to consider the sourcing of the biofuels that you use, and local production of waste oil is one of the best, most sustainable options. The California Air Resources Board will agree upon biofuel standards later this year, as part of the Low-Carbon Fuel Standard.

Appendices



Appendix A:

The Local Government Operations Protocol

This inventory follows the standard outlined in the Local Government Operations Protocol, which was adopted in 2008 by the California Air Resources Board (ARB) and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. This and the other inventories conducted for the Silicon Valley Climate Protection partnership are the first to follow LGOP, representing a strong step toward standardizing how inventories are conducted and reported.

A.1 Local Government Operations Protocol

A.1.1 Background

In 2008, ICLEI, ARB, and the California Climate Action Registry (CCAR) released LGOP to serve as a U.S. supplement to the International Emissions Analysis Protocol. The purpose of LGOP is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. It leads participants through the process of accurately quantifying and reporting emissions, including providing calculation methodologies and reporting guidance. LGOP guidance is divided into three main parts: identifying emissions to be included in the inventory, quantifying emissions using best available estimation methods, and reporting emissions.

The overarching goal of LGOP is to allow local governments to develop emissions inventories using standards that are consistent, comparable, transparent, and recognized nationally, ultimately enabling the measurement of emissions over time. LGOP adopted five overarching accounting and reporting principles toward this end: relevance, completeness, consistency, transparency and accuracy. Methodologies that did not adhere to these principles were either left out of LGOP or included as Scope 3 emissions. LGOP was created solely to standardize how emissions inventories are conducted and reported; as such it represents a currently accepted standard for inventorying emissions but does not contain any legislative or program-specific requirements. Mandates by the State of California or any other legislative body, while possibly using LGOP as a standard, do not currently exist, and California local governments are not currently required to inventory their emissions. Program-specific

requirements, such as ICLEI's Milestones or CCAR's reporting protocol, are addressed in LGOP but should not be confused with LGOP itself.

Also, while LGOP standardizes inventories from government operations, it does not seek to be a wholly accurate inventory of all emissions sources, as certain sources are currently excluded or otherwise impossible to accurately estimate. This and all emissions inventories therefore represent a best estimate of emissions using best available data and calculation methodologies; it does not provide a complete picture of all emissions resulting from San Carlos' operations, and emissions estimates are subject to change as better data and calculation methodologies become available in the future.

A.1.2 Organizational Boundaries

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important first step in the inventory process. The organizational boundary for the inventory determines which aspects of operations are included in the emissions inventory, and which are not. Under LGOP, two control approaches are used for reporting emissions: operational control or financial control. A local government has operational control over an operation if it has full authority to introduce and implement its operating policies at the operation. A local government has financial control if the operation is fully consolidated in financial accounts. If a local government has joint control over an operation, the contractual agreement will have to be examined to see who has authority over operating policies and implementation, and thus the responsibility to report emissions under operational control.²¹ Local governments must choose which approach is the most applicable and apply this approach consistently throughout the inventory.

While both control approaches are acceptable, there may be some instances in which the choice may determine whether a source falls inside or outside of a local government's boundary. LGOP strongly encourages local governments to utilize operational control as the organization boundary for a government operations emissions inventory. Operational control is believed to most accurately represent the emissions sources that local governments can most directly influence, and this boundary is consistent with other environmental and air quality reporting program requirements. For this reason, all inventories in the Silicon Valley Climate Protection Partnership are being conducted according to the operational control framework.

A.1.3 Types of Emissions

The greenhouse gases inventoried in this report are described in Section 2.1. As described in LGOP, emissions from each of the greenhouse gases can come in a number of forms:

²¹ Please see Local Government Operations Protocol for more detail on defining your organizational boundary: <http://www.icleiusa.org/programs/climate/ghg-protocol>

Stationary or mobile combustion: These are emissions resulting from on-site combustion of fuels (natural gas, diesel, gasoline, etc.) to generate heat, electricity, or to power vehicles and mobile equipment.

Purchased electricity: These are emissions produced by the generation of power from utilities outside of the jurisdiction.

Fugitive emissions: Emissions that result from the unintentional release of greenhouse gases into the atmosphere (e.g., leaked refrigerants, methane from waste decomposition, etc.).

Process emissions: Emissions from physical or chemical processing of a material (e.g., wastewater treatment).

A1.4 Quantifying Emissions

Emissions can be quantified two ways:

Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This methodology is not generally available for most types of emissions and will only apply to a few local governments that have these monitoring systems.

The majority of the emissions recorded in the inventory can be and will be estimated using **calculation-based methodologies** to calculate their emissions using activity data and emission factors. To calculate emissions, the equation below is used:

Activity Data x Emission Factor = Emissions

Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual energy consumption, and annual vehicle mileage by vehicle type. Emissions factors are calculated ratios relating emissions to a proxy measure of activity at an emissions source (e.g., CO₂ generated/kWh consumed). For a list of common emissions calculations see Table 2.2.

The guidelines in LGOP are meant to provide a common method for local governments to quantify and report greenhouse gas emissions by using comparable activity data and emissions factors. However, LGOP recognizes that local governments differ in how they collect data concerning their operations and that many are not able to meet the data needs of a given estimation method. Therefore, LGOP outlines both “recommended” and “alternative” methods to estimate emissions from a given source. In this system, recommended methods are the preferred method for estimating emissions, as they will result in the most accurate estimate for a given emission source. Alternative methods often require less intensive data collection, but are likely to be less accurate. This approach allows local governments to estimate emissions based on the data currently available to them. It also allows local governments

that are unable to meet the recommended methods to begin developing internal systems to collect the data needed to meet these methods.

This inventory has used the recommended activity data and emissions factors wherever possible, using alternative methods where necessary. For details on the methodologies used for each sector, see Appendix B.

A.1.5 Reporting Emissions

A.1.5.1 Significance Thresholds

Within any local government's own operations there will be emission sources that fall within Scope 1 and Scope 2 that are minimal in magnitude and difficult to accurately measure. Within the context of local government operations, emissions from leaked refrigerants, backup generators and other septic tanks may be common sources of these types of emissions. For these small, difficult to quantify emission sources, LGOP specifies that up to 5 percent of total emissions can be reported using estimation methods not outlined in LGOP.²²

In this report, the following emissions fell under the significance threshold and were reported using best available methods:

- Scope 1 fugitive emissions from leaked vehicle refrigerants from HV/AC
- Scope 1 CH₄ and N₂O emissions from vehicle fleet

A.1.5.2 Units Used in Reporting Emissions

LGOP requires reporting of individual gas emissions, and this reporting is included in Appendix B. In this narrative report, emissions from all gases released by an emissions source (e.g., stationary combustion of natural gas in facilities) are combined and reported in metric tons of carbon dioxide equivalent (CO₂e). This standard is based on the global warming potential (GWP) of each gas, which is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide. For the GWPs of reported greenhouse gases, see Table 2.1.

A.1.5.3 Information Items

Information items are emissions sources that, for a variety of reasons, are not included as Scope 1, 2, or 3 emissions in the inventory. In order to provide a more complete picture of emissions from San Carlos' operations, however, these emissions should be quantified and reported.

²² In the context of registering emissions with an independent registry (such as the California Climate Action Registry), emissions that fall under the significance threshold are called *de minimis*. This term, however, is not used in LGOP and was not used in this inventory.

In this report, the following emissions are included as information items (emission quantities are reported in Appendix B):

- Scope 3 CO₂ emissions from biofuel consumption and employee commutes
- Ozone depleting chemical used as refrigerants (R-22 and R-12)

A common emission type that is categorized as an information item is carbon dioxide released by the combustion of biogenic fuels. Local governments will often burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate power. Common sources of biogenic emissions are the combustion of landfill gas from landfills or biogas from wastewater treatment plants, as well as the incineration of organic municipal solid waste at incinerators.

Carbon dioxide emissions from the combustion of biogenic fuels are not included in Scope 1 based on established international principles.²³ These principles indicate that biogenic fuels (e.g., wood, biodiesel), if left to decompose in the natural environment, would release CO₂ into the atmosphere, where it would then enter back into the natural carbon cycle. Therefore, when wood or another biogenic fuel is combusted, the resulting CO₂ emissions are akin to natural emissions and should therefore not be considered as human activity-generated emissions. The CH₄ and N₂O emissions, however, would not have occurred naturally and are therefore included as Scope 1 emissions.

A.2 Baseline Years

Part of the local government operations emissions inventory process requires selecting a “performance datum” with which to compare current emissions, or a base year. Local governments should examine the range of data they have over time and select a year that has the most accurate and complete data for all key emission sources. It is also preferable to establish a base year several years in the past to be able to account for the emissions benefits of recent actions. A local government’s emissions inventory should comprise all greenhouse gas emissions occurring during a selected *calendar* year.

For the Silicon Valley Climate Protection Partnership inventories, 2005 was chosen as the baseline year, since this year is increasingly becoming the standard for such inventories; the 1990 baseline year for California is usually difficult for most local governments to meet and would not produce the most accurate inventory.

After setting a base year and conducting an emissions inventory for that year, local governments should make it a practice to complete a comprehensive emissions inventory on a regular basis to compare to the baseline year. ICLEI recommends conducting an emissions inventory at least every five years.

²³ Methane and nitrous oxide emissions from biogenic fuels are considered Scope 1 stationary combustion emissions and are included in the stationary combustion sections for the appropriate facilities.

Appendix B:

LGOP Standard Report

Local Government Operations Standard Inventory Report



1. Local Government Profile

Jurisdiction Name:	City of San Carlos
Street Address:	600 Elm Street
City, State, ZIP, Country:	San Carlos, CA 94070
Website Address:	www.cityofsancharlos.org
Size (sq. miles):	5.92 square miles
Population:	28839
Annual Budget:	\$46 mil total / \$28 mil general fund
Employees (Full Time Equivalent):	111
Climate Zone:	CA Climate Zone 3
Annual Heating Degree Days:	3649*
Annual Cooling Degree Days:	292**
Lead Inventory Contact Name:	Brian Moura
Title:	Assistant City Manager
Department:	City Manager Department
Email:	bmoura@cityofsancharlos.org
Phone Number:	(650) 802-4210

* www.energycodes.gov/Implement/pdfs/climate_paper_review_draft_rev.pdf

** www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp#

Services Provided:

<input type="checkbox"/> Water treatment	<input type="checkbox"/> Mass transit (buses)	<input type="checkbox"/> Hospitals	<input type="checkbox"/> Natural gas utility
<input checked="" type="checkbox"/> Water distribution	<input type="checkbox"/> Mass transit (light rail)	<input type="checkbox"/> Airport	<input type="checkbox"/> Other (Specify below)
<input type="checkbox"/> Wastewater treatment	<input type="checkbox"/> Mass transit (ferries)	<input type="checkbox"/> Seaport/shipping terminal	<div style="border: 1px solid black; height: 40px; width: 100%;"></div>
<input type="checkbox"/> Wastewater collection	<input type="checkbox"/> Schools (primary/secondary)	<input type="checkbox"/> Marina	
<input type="checkbox"/> Electric utility	<input type="checkbox"/> Schools (colleges/universities)	<input type="checkbox"/> Stadiums/sports venues	
<input type="checkbox"/> Fire Protection	<input type="checkbox"/> Solid waste collection	<input type="checkbox"/> Convention center	
<input checked="" type="checkbox"/> Police	<input type="checkbox"/> Solid waste disposal	<input checked="" type="checkbox"/> Street lighting and traffic signals	

Local Government Description:

San Carlos, "The City of Good Living," is located in the center of the San Francisco Bay Area and has everything at its doorstep. San Francisco is 25 miles north and San Jose is 25 miles south. San Carlos boasts an ideal climate, good government, an outstanding school system, attractive residential areas, a fine shopping district, excellent restaurants, a modern industrial and commercial area and plenty of open space. As part of the northern end of Silicon Valley, San Carlos hosts several technology companies and is the address of many of the West Coast's biotech and medical instrumentation firms. You'll find friendly, involved people here and an inviting community atmosphere.

2. GHG Inventory Details

Reporting Year:	2005
Protocol Used:	Local Government Operations Protocol, Version 1.0 (September 2008)
Control Approach:	e.g. Operational Control

GHG Emissions Summary (All Units in Metric Tons Unless Stated Otherwise)

Note: CO₂e totals listed here are summed totals of the estimated emissions of each inventoried gas based upon their global warming potentials (Appendix E of LGOP)

BUILDINGS & OTHER FACILITIES								
SCOPE 1		CO ₂ e	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆
	Stationary Combustion	283.375	282.651	0.027	0.001			
	Fugitive Emissions							
	Total Direct Emissions from Buildings & Facilities	283.375	282.651	0.001	0.001	0.000	0.000	0.000
SCOPE 2		CO ₂ e	CO ₂	CH ₄	N ₂ O			
	Purchased Electricity	329.948	327.260	0.019	0.007			
	Purchased Steam							
	District Heating & Cooling							
	Total Indirect Emissions from Buildings & Facilities	329.948	327.260	0.019	0.007			
SCOPE 3		CO ₂ e						
	See list at bottom for some examples							
INDICATORS		Operating Hours						
	Square Footage							
	Number of Employees							

STREETLIGHTS AND TRAFFIC SIGNALS					
SCOPE 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	241.042	239.078	0.014	0.005
	Total Indirect Emissions from Streetlights and Traffic Signals	241.042	239.078	0.005	0.014
SCOPE 3		CO ₂ e			
	See list at bottom for some examples				
INDICATORS					

WATER DELIVERY FACILITIES									
SCOPE 1		Stationary Combustion Total Direct Emissions from Water Delivery Facilities	CO ₂ e	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆
			0.447	0.446	0.000	0.000			
			0.447	0.446	0.000	0.000	0.000	0.000	0.000
SCOPE 2		Purchased Electricity Purchased Steam District Heating & Cooling Total Indirect Emissions from Water Delivery Facilities	CO ₂ e	CO ₂	CH ₄	N ₂ O			
			17.265	17.124	0.001	0.000			
			17.265	17.124	0.001	0.000			
SCOPE 3		See list at bottom for some examples	CO ₂ e						
INDICATORS		Gallons of Drinking Water Treated							
		Gallons of Water Transported							

VEHICLE FLEET								
SCOPE 1		Mobile Combustion	CO ₂ e	CO ₂	CH ₄	N ₂ O	HFCs	PFCs
		Fugitive Emissions	416.440	409.039	0.020	0.023		
			8.400				0.002	
		Total Direct Emissions from Vehicle Fleet	424.840	409.039	0.020	0.023	0.002	0.000
SCOPE 2		Purchased Electricity for Electric Vehicles	CO ₂ e	CO ₂	CH ₄	N ₂ O		
		Total Indirect Emissions from Vehicle Fleet	0.000	0.000	0.000	0.000		
SCOPE 3		See list at bottom for some examples	CO ₂ e					
INDICATORS		Number of Vehicles						
		Vehicle Miles Traveled						
		Number of Pieces of Equipment						
		Equipment Operating Hours						

WASTE GENERATION		CO ₂ e
SCOPE 3		
Waste All Facilities		92.974
INDICATORS		Short tons of solid waste accepted for disposal
		366.763
		Short tons of recyclable materials accepted for processing

EMPLOYEE COMMUTE			
SCOPE 3		CO ₂ e	
	Mobile Combustion		353.424
INDICATORS	Vehicle Miles Traveled		
	Number of Vehicles		

INFORMATION ITEMS			
		CO ₂ e	
	Employee Commute B100		11.125
	R-22		38.555
	R-12		25.440
	Total Information Items		75.120

Total Emissions							
		CO ₂ e	CO ₂	CH ₄	N ₂ O	HFCs	PFCs
SCOPE 1		708.662	692.135	0.020	0.023	0.002	0.000
SCOPE 2		588.255	583.461	0.026	0.022	0.000	0.000
SCOPE 3		446.398					
INFORMATION ITEMS		75.120					

POSSIBLE SOURCES OF OPTIONAL SCOPE 3 EMISSIONS		POSSIBLE INFORMATION ITEMS	
	Employee Commute		Biogenic CO ₂ from Combustion
	Employee Business Travel		Carbon Offsets Purchased
	Emissions From Contracted Services		Carbon Offsets Sold
	Upstream Production of Materials and Fuels		Renewable Energy Credits (Green Power) Purchased
	Upstream and Downstream Transportation of Materials and Fuels		Renewable Energy Credits Sold (GreenPower)
	Waste Related Scope 3 Emissions		Ozone-depleting Refrigerants/Fire Suppressants not in LGOP
	Purchase of Electricity Sold to an End User		Other Information Items
	Transmission and Distribution Losses from Consumed Electricity		
	Other Scope 3		

Local Government Operations Standard Inventory Report



3. Activity Data Disclosure

Every emission source must be accompanied by a reference for the activity data. This worksheet is meant to assist in recording activity data and the methods used to gather those data for government operations. Activity data represent the magnitude of human activity resulting in emissions; data on energy use, fuel consumption, vehicle miles traveled, and waste generation are all examples of activity data that are used to compute GHGs. Detailed disclosure should be made of the activity data used and at what quantities. This disclosure should also cite the source(s) of the data and the methodology used, including whether that methodology is a recommended method or an alternate method.

Deviations from the primary methodology should be explained in detail. All assumptions and estimations should be cited as such. Local governments may also use this space in the reporting format to discuss the rationale for the inclusion or exclusion of optional inventory components. It is good practice to include appropriate citations (such as website URL, report title, etc) and all contact information that is necessary to verify the source and accuracy of the activity data.

BUILDINGS & OTHER FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Natural Gas	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	53,270	therms	PG&E
	CO ₂	Primary	Known fuel use	53,270	therms	PG&E
	CH ₄	Primary	Known fuel use	53,270	therms	PG&E
	N ₂ O	Primary	Known fuel use	53,270	therms	PG&E
	HFCs					
	PFCs					
	SF ₆					

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	1,474,945	kWh	PG&E
	CO ₂	Primary	Known Electricity Use	1,474,945	kWh	PG&E
	CH ₄	Primary	Known Electricity Use	1,474,945	kWh	PG&E
	N ₂ O	Primary	Known Electricity Use	1,474,945	kWh	PG&E
	HFCs					
	PFCs					
	SF ₆					

STREETLIGHTS AND TRAFFIC SIGNALS (Chapter 6.2)
SCOPE 2
Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	1,077,512	kWh	PG&E
	CO ₂	Primary	Known Electricity Use	1,077,512	kWh	PG&E
	CH ₄	Primary	Known Electricity Use	1,077,512	kWh	PG&E
	N ₂ O	Primary	Known Electricity Use	1,077,512	kWh	PG&E
	HFCs					
	PFCs					
	SF ₆					

WATER DELIVERY FACILITIES (Chapter 6)
SCOPE 1
Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Natural Gas	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	84	therms	PG&E
	CO ₂	Primary	Known Fuel Use	84	therms	PG&E
	CH ₄	Primary	Known Fuel Use	84	therms	PG&E
	N ₂ O	Primary	Known Fuel Use	84	therms	PG&E
	HFCs					
	PFCs					
	SF ₆					

SCOPE 2
Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	77,177	kWh	PG&E
	CO ₂	Primary	Known Electricity Use	77,177	kWh	PG&E
	CH ₄	Primary	Known Electricity Use	77,177	kWh	PG&E
	N ₂ O	Primary	Known Electricity Use	77,177	kWh	PG&E
	HFCs					
	PFCs					
	SF ₆					

VEHICLE FLEET (Chapter 7)
SCOPE 1
Mobile Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Gasoline	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	35,243	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	CO ₂	Primary	Known Fuel Use	35,243	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	CH ₄	Alternate	Known fuel use by vehicle type, inventory year, and fuel type.	35,243	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	N ₂ O	Alternate	Known fuel use by vehicle type, inventory year, and fuel type.	35,243	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	HFCs					
	PFCs					
	SF ₆					

Diesel	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	9,733	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	CO ₂	Primary	Known Fuel Use	9,733	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	CH ₄	Alternate	Known fuel use by vehicle type, inventory year, and fuel type.	9,733	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	N ₂ O	Alternate	Known fuel use by vehicle type, inventory year, and fuel type.	9,733	gallons	Marilyn Maytum, Senior Accountant, City of San Carlos
	HFCs					
	PFCs					
	SF ₆					

Fugitive Emissions

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Refrigerants	R-134	Alternate	Estimation based upon equipment inventory and use	8	kg	Danny Vergara, Mechanic, City of San Carlos

WASTE GENERATION (Scope 3)**SCOPE 3**

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Generated Waste	CH ₄	Primary/Alternate	Combined data set: 1) Known waste weight (Primary); 2) Estimated waste weight based upon volume and number of containers (Alternate)	367	tons	Jennifer Chicconi, Community Relations Manager, Allied Waste

EMPLOYEE COMMUTE (Scope 3)**SCOPE 3****Stationary Combustion**

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Gasoline	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	39,210	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	CO ₂	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	39,210	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	CH ₄	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	39,210	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	N ₂ O	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	39,210	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	HFCs					
	PFCs					
	SF ₆					

INFORMATION ITEMS**Stationary Combustion**

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Ozone Depleting Refrigerants	R-22	Alternate	Estimation based upon equipment inventory and use	23	kg	Pat Thomasson, Sr. Maintenance Worker, City of San Carlos
	R-12	Alternate	Estimation based upon equipment inventory and use	2	kg	Danny Vergara, Mechanic, City of San Carlos

Biodiesel 100 (Employee Commute)	CO ₂ e	Primary	Application of GWP to CH ₄ and N ₂ O calculations listed below; sum of three primary GHGs (CO ₂ , CH ₄ and N ₂ O.)	1,176	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	CO ₂	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	1,176	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	CH ₄	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	1,176	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	N ₂ O	Alternate	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all respondents extrapolated to represent all local government employees	1,176	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in possession of Brian Moura, Assistant City Manager
	HFCs					
	PFCs					
	SF ₆					

POSSIBLE SOURCES OF OPTIONAL SCOPE 3 EMISSIONS

Employee Commute
Employee Business Travel
Emissions From Contracted Services
Upstream Production of Materials and Fuels
Upstream and Downstream Transportation of Materials and Fuels
Waste Related Scope 3 Emissions
Purchase of Electricity Sold to an End User
Transmission and Distribution Losses from Consumed Electricity
Other Scope 3

POSSIBLE INFORMATION ITEMS

Biogenic CO₂ from Combustion
Carbon Offsets Purchased
Carbon Offsets Sold
Renewable Energy Credits (Green Power) Purchased
Renewable Energy Credits Sold (GreenPower)
Ozone-depleting Refrigerants/Fire Suppressants not in LGOP
Other Information Items

Local Government Operations Standard Inventory Report



4. Calculation Methodology Disclosure

In addition to activity data, every emission source must be accompanied by the emission factor used, a reference for each emission factor, and the calculation

BUILDINGS & OTHER FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions	Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Natural Gas		CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
		CO ₂	Default	53.06 kg/MMBtu	LGOP v1 Table G.1
		CH ₄	Default	5 g/MMBtu	LGOP v1 Table G.3
		N ₂ O	Default	0.1 g/MMBtu	LGOP v1 Table G.3
		HFCs			
		PFCs			
		SF ₆			

SCOPE 2**Purchased Electricity**

Emissions	Source Name GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH ₄	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N ₂ O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	HFCs			
	PFCs			
	SF ₆			

STREETLIGHTS AND TRAFFIC SIGNALS (Chapter 6.2)**SCOPE 2****Purchased Electricity**

Emissions	Source Name GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH ₄	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N ₂ O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	HFCs			
	PFCs			
	SF ₆			

WATER DELIVERY FACILITIES (Chapter 6)**SCOPE 1****Stationary Combustion**

Emissions	Source Name GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Natural Gas	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	53.06 kg/MMBtu	LGOP v1 Table G.1
	CH ₄	Default	5 g/MMBtu	LGOP v1 Table G.3
	N ₂ O	Default	0.1 g/MMBtu	LGOP v1 Table G.3
	HFCs			
	PFCs			
	SF ₆			

SCOPE 2**Purchased Electricity**

Emissions	Source Name GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH ₄	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N ₂ O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	HFCs			
	PFCs			
	SF ₆			

VEHICLE FLEET (Chapter 7)**SCOPE 1****Mobile Combustion**

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Gasoline	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	8.81 kg/gallon	LGOP v1 Table G.9
	CH ₄	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	N ₂ O	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	HFCs			
	PFCs			
	SF ₆			
Diesel	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	10.15 kg/gallon	LGOP v1 Table G.9
	CH ₄	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	N ₂ O	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	HFCs			
	PFCs			
	SF ₆			

Fugitive Emissions

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Refrigerants	R-134	None	GWP-1,000	LGOP v1 Table E.1

WASTE GENERATION (Scope 3)**SCOPE 3**

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Generated Waste	CH ₄	Alternate	Varies by waste type	EPA Waste Reduction Model http://www.epa.gov/climatechange/wydc/waste/calculators/Warm_home.html ; Public Administration waste characterization provided by CIWMB

EMPLOYEE COMMUTE (Scope 3)**SCOPE 3****Stationary Combustion**

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Gasoline	CO ₂ e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO ₂	Default	8.81 kg/gallon	LGOP v1 Table G.9
	CH ₄	Default	0.02990 g/mi (cars)	LGOP v1 Table G.13
	N ₂ O	Default	0.03413 g/mi (cars)	LGOP v1 Table G.13
	HFCs			
	PFCs			
	SF ₆			

INFORMATION ITEMS				
Stationary Combustion				
Emissions	Source Name GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Ozone Depleting Refrigerants	R-22	None	GWP-1,700	http://www.epa.gov/ozone/science/ods/classone.html
	R-12	None	GWP-10,600	http://www.epa.gov/ozone/science/ods/classone.html
Biodiesel 100 (Employee Commute)	CO ₂ e			
	CO ₂	Default	9.46 kg/gallon	LGOP v1 Table G9
	CH ₄			
	N ₂ O			
	HFCs			
	PFCs			
	SF ₆			
POSSIBLE SOURCES OF OPTIONAL SCOPE 3 EMISSIONS			POSSIBLE INFORMATION ITEMS	
Employee Commute			Biogenic CO ₂ from Combustion	
Employee Business Travel			Carbon Offsets Purchased	
Emissions From Contracted Services			Carbon Offsets Sold	
Upstream Production of Materials and Fuels			Renewable Energy Credits (Green Power) Purchased	
Upstream and Downstream Transportation of Materials and Fuels			Renewable Energy Credits Sold (GreenPower)	
Waste Related Scope 3 Emissions			Ozone-depleting Refrigerants/Fire Suppressants not in LGOP	
Purchase of Electricity Sold to an End User			Other Information Items	
Transmission and Distribution Losses from Consumed Electricity				
Other Scope 3				

Appendix C:

Employee Commute

Emissions from employee commutes make up an important optional source of emissions from any local government's operations. The scale of emissions from employee commutes is often large in comparison with many other facets of local government operations, and local governments can affect how their employees get to and from work through a variety of incentives. For this reason, ICLEI recommends estimating emissions from employee commutes as part of a complete government operations greenhouse gas emissions inventory.

To assist in the data collection process, ICLEI provided the jurisdictions with both an online and a paper copy of an employee commute survey.²⁴ The questions in the survey were aimed at finding three categories of information:

- **Activity data** to calculate emissions from employee commute (vehicles miles traveled, vehicle type, vehicle model year) both current and in 2005.
- **Indicator data** to help San Carlos understand how much time and money employees spend as they commute, as well as how many employees use alternative modes of transportation to get to work.
- **Policy data** that will serve as guidance for San Carlos as it adopts policies aimed at reducing emissions from employee commutes. These questions asked employees for their interest in alternative modes of transportation as well as what policies would be most effective in allowing them to switch modes of transportation away from driving alone.

This section provides the emissions estimation methodology and both surveys. Individual survey results are in the possession of City staff.

C.1 Methodology Summary

The methodology for estimating the employee commute emissions portion of the inventory is similar to the mobile emissions methodology outlined in the mobile emissions section of Appendix B. San Carlos administered the employee commute survey to 105 current employees working for the City, and 103 employees responded to the

²⁴ The paper survey was administered only to employees that do not have access to a computer. The survey asked slightly different questions but was aimed at garnering the same emissions and policy-relevant data as the electronic survey.

survey (a response rate of 98 percent). The survey was administered in 2008 and current data was used as a proxy for 2005 data. Both full time and part-time employee data were included.

To calculate emissions, the survey collected the following information:

- The number of days and number of miles employees drive alone to work (one-way) in an average week
- The number of days they carpooled and how often they drove the carpool in an average week
- The vehicle type of their vehicle and the type of fuel consumed

These weekly data were then converted into annual VMT estimates by the following equation:

Number of days driven to work/week x to-work commute distance x 2 x 48 weeks worked/year

Actual CO₂e emissions from respondents' vehicles were calculated by converting vehicle miles traveled per week by responding employees into annual fuel consumption by fuel type (gasoline, diesel). The VMT data collected were converted to fuel consumption estimates using fuel economy of each vehicle type.²⁵

ICLEI then extrapolated estimated fuel consumption to represent all 105 of San Carlos' employees in 2005. This was a simple extrapolation, multiplying the estimated fuel consumption number by the appropriate factor to represent all current employees. For example, if 33.3 percent of employees responded, fuel consumption numbers were tripled to estimate fuel consumption for all employees. This is not a statistical analysis and no uncertainty has been calculated as there is uncertainty not only at the extrapolation point but also in the calculation of actual emissions. Therefore, the resulting calculated emissions should be seen as directional and not as statistically valid.

²⁵ Fuel efficiency estimates from www.fueleconomy.gov, EPA *Green Fleets Guide* and other national sources.

C.2 Electronic Employee Commute Survey

1. Introduction

The purpose of this survey is to gather information on your commute to work so your employer can offer the best transportation options to you while reducing the jurisdiction's impact on the environment. The survey should take no more than 15 minutes.

Unless otherwise indicated, all questions refer to a ONE-WAY commute TO WORK only. Please do not include any traveling you do during work hours (meetings, site visits, etc). Any question with an asterisk (*) next to it requires an answer in order to proceed.

Please note that this survey is completely anonymous. We will not collect or report data on any individuals who respond to the survey.

Thank you very much.

2. Workplace

Please provide the following information regarding your workplace. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What local government do you currently work for?

Atherton
Belmont
Brisbane
Burlingame
Campbell
Colma
Cupertino
Daly City
East Palo Alto
Foster City
Gilroy
Half Moon Bay
Los Altos
Los Gatos
Milpitas
Mountain View
Pacifica
Portola Valley
Redwood City
San Bruno
San Carlos
San Mateo County
Santa Clara
Santa Clara County
Santa Cruz County
Saratoga
South San Francisco
Woodside

*2. What department do you work in?

3. Commuter Background Information

Please provide the following information regarding your background. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What city/town do you live in?

*2. How many miles do you live from your place of work?

(please enter a whole number)

3. How many minutes does your commute to work typically take?

(please enter a whole number)

4. In a typical week, how much money do you spend on your ROUND TRIP commute? (transit fees, gas, tolls, etc-please enter a number)

5. If you drive to work, what type of vehicle do you usually drive?

Full-size auto

Mid-size auto

Compact/hybrid

Light truck/SUV/Pickup

Van

Heavy Truck

Motorcycle/scooter

6. What year is your vehicle?

(please enter a four digit year)

7. What type of fuel does your vehicle use?

Gas

Diesel

Biodiesel (B20)

Biodeisel (B99 or B100)

Electric

Other (please specify-if Ethanol please indicate grade)

4. Employment Information

Please provide the following information regarding your employment. Click "Next" at the bottom when finished or click "Prev" to go back.

1. Do you typically travel to work between 6-9 am Monday-Friday?

Yes

No

If No, please specify what time of day you commute:

2. Does your position allow you to have flexible hours or to telecommute?

Yes

No

*3. Are you a full time employee or part time employee?

Full

Part

5. Part Time Employees

Please provide the following information regarding your part time employment. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What is the average number of days you work per week?

(please enter a number)

6. Current Daily Commute

Please provide the following information regarding your current daily commute. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. In a typical week, do you drive to work alone at least once?

Yes

No

7. Drive Alone

Click "Next" at the bottom when finished or click "Prev" to go back.

*1. How many DAYS a week do you drive alone to work?

(please enter a number)

*2. How many MILES PER DAY do you drive TO WORK ONLY?

(please enter a number)

8. Carpool

Click "Next" at the bottom when finished or click "Prev" to go back.

*1. In a typical week, do you carpool to work at least once?

Yes

No

9. Carpool

*1. How many DAYS a week do you carpool?

(please enter a number)

*2. How many MILES do you drive TO WORK ONLY when you carpool?

(please enter a number)

3. How many PEOPLE are in your carpool?

(please enter a number)

*4. How many DAYS a week are you the driver of the carpool?

(please enter a number)

10. Public Transit

*1. In a typical week, do you take public transit to work at least once?

Yes

No

11. Public Transit

*1. How many DAYS a week do you take public transit TO WORK?

(please enter a number)

2. What type of public transit do you take TO WORK?

SamTrans

BART

Caltrain

VTA Bus

VTA Rail

ACE Train

Capitol Corridor

City Operated Transit

Paratransit

Other (please specify)

12. Bike/Walk

*1. In a typical week, do you bike or walk to work at least once?

Yes

No

13. Bike/Walk

1. How many DAYS a week do you bike to work?
(please enter a number)

2. How many DAYS a week do you walk to work?
(please enter a number)

14. Telecommute

1. If you telecommute:
How many DAYS do you telecommute in a typical week?
(please enter a number)
If you do not telecommute, leave this question blank.

15. Commute in Base Year

Please provide the following information regarding your commute in 2005.

*1. Did you work for us in 2005?
Yes
No

16. Commute in Base Year

Please provide the following information regarding your commute in your base year.

*1. In 2005, did you typically commute by the same mode(s) as you do now?
Yes
No

17. Commute in Base Year

Please provide the following information regarding your commute change.

1. Why did you change your commute mode?

18. 2005 Daily Commute

Please provide the following information regarding your 2005 daily commute.

*1. In 2005, did you typically drive to work alone at least once a week?
Yes
No

19. Drive Alone

*1. In 2005, how many DAYS a week did you typically drive alone?
(please enter a number)

*2. In 2005, how many MILES a day did you typically drive TO WORK ONLY?
(please enter a number)

20. Carpool

*1. In 2005, did you carpool at least once in a typical week?
Yes
No

21. Carpool

*1. In 2005, how many DAYS did you typically carpool in a week?
(please enter a number)

*2. In 2005, how many MILES did you typically drive TO WORK when you carpooled?
(please enter a number)

*3. In 2005, how many DAYS in a typical week were you the driver of your carpool?
(please enter a number)

22. Public Transit

*1. In 2005, did you typically take public transit to work at least once a week?

Yes

No

23. Public Transit

*1. In 2005, how many days in a typical week did you take public transit TO WORK?
(please enter a number)

2. In 2005, what type of public transit did you take TO WORK?

SamTrans

BART

VTA Bus

VTA Rail

ACE Train

Capitol Corridor

City Operated Transit

Paratransit

Other (please specify)

24. Bike/Walk

*1. In 2005, did you typically bike or walk to work at least once a week?

Yes

No

25. Bike/Walk

1. In 2005, how many DAYS did you typically bike to work in a week?
(please enter a number)

2. In 2005, how many DAYS did you typically walk to work in a week?
(please enter a number)

26. Telecommute

1. If you telecommuted in 2005:

How many DAYS in a typical week in 2005 did you telecommute?

(please enter a number)

If you did not telecommute in 2005, leave this question blank.

27. Commute Preference Information

Please answer the following questions regarding your CURRENT commute.

1. Why have you chosen your current commute mode?

2. Would you consider taking any of the following transportation modes? (check all that apply):

Public Transportation

Carpooling

Vanpooling

Bicycling

Walking

Other (please specify)

*3. Is there a transit route that you would use to commute by public transit?

Yes

No

4. If no to question 3, please explain why not.

5. If you drive alone, which, if any, of the following benefits would encourage you to take alternative forms of transportation?
(check all that apply)

Vanpool/carpool incentives

Pre-tax transit checks

Parking cash-out (reimbursement to give up your parking spot)

Improved transit options

Improved walking routes/conditions

Telecommuting option

Free/inexpensive shuttle

Free public transit benefit

Subsidizing bicycle purchase

Improved bike routes/conditions

Better information about my commute options

None of the above

Other (please specify)

28. Comments

1. If you have other concerns or issues related to your commute, or if something we should know about was not captured in any survey questions, please describe below.

29. Thank You

Thank you for responding to this survey!

C.3 Paper Employee Commute Survey

<Insert Logo Here>

< Jurisdiction name> Employee Commute Survey

<Date>:

To all of our employees:

As you may be aware, *<local government name>* is actively working to reduce its impact on the environment. As part of this effort, we are collecting information on our employee's commuting patterns and preferences. This will help us to better understand what impact our employees' commutes are having on climate change *and* to provide ways to make your commute easier and less expensive.

Please take 15 minutes to fill out this survey created by ICLEI-Local Governments for Sustainability. **Please complete the survey by *<due date>* and return to *<name>* in the *<department>*.**

This survey is completely anonymous. We will not be collecting or reporting any individual responses.

If you have any questions regarding the survey, please feel free to contact me at *<phone number>*.

Thank you very much,

<Your name>

< *Jurisdiction name* > Employee Commute Survey

Unless otherwise indicated, all questions refer to a one-way commute to work only. Please do not include any traveling you do during work hours (e.g., meetings, site visits, etc). Asterisks (*) indicate questions that require an answer.

A. Commuter Background Information

1. About how many miles do you live from work?

2. What city/town do you live in?

- * 3. If you drive to work, what type of vehicle do you usually drive? (check one) If you don't drive to work, skip to Section B.

☐ Full size auto

☐ Compact/hybrid

☐ Heavy truck

☐ Mid size auto

☐ SUV/Pickup

☐

Other _____
- * 4. What year was your vehicle manufactured?

- * 5. What type of fuel does your vehicle use? (if biodiesel or ethanol, specify grade) _____

B. Estimate Your Current Commute for a typical work week.

- * 1. Please enter below the number of days per week you use each type of commute mode and the number of miles you travel each day **to work only** in a typical week:

Commute Mode	Drive Alone	Carpool	Vanpool	Public Transit	Bike	Walk	Other (specify)
Days per week you travel <i>to work</i> by this mode (max 7)							
Miles Traveled <i>to work per day</i> in this mode							

2. How much does your **round trip** commute cost per week?
\$ _____
3. How many minutes does your commute to work typically take?

4. If you take public transit, what transit agency do you use?

- *5. If you carpool to work, how many days in a typical week are you the driver?

6. How many days do you telecommute in a typical week?

C. Employment Information (check one answer for each question)

1. Are you a full time or part time employee? ☐ Full ☐ Part
2. Do you typically travel to work between 6-9 a.m.? ☐ Y ☐ N
3. Does your position allow you to have flexible hours or to telecommute? ☐ Y ☐ N
4. What department do you work for?

5. D. Your Commute in 2005

- *1. Did you work for us in 2005? ☐ Y ☐ N
- *2. If yes to Q.1, did you typically commute by the same mode(s) as you do now? ☐ Y ☐ N
- *3. If no to Q.2, please enter the number of miles you traveled (*to work only*) in a typical week in 2005 below:

Commute Mode	Drive Alone	Carpool	Vanpool	Public Transit	Bike	Walk	Other
Days per Week (max 7)							
Miles Traveled to Work per Day							

If you commute differently now than in 2005, why did you change your commute mode?

E. Current Commute Preference Information

1. Why have you chosen your current commute mode?
- _____
2. Would you consider taking any of the following transportation modes?(check all that apply):
☐ Carpooling ☐ Vanpooling ☐ Bicycling
☐ Public transit ☐ Walking ☐ Other _____
 3. a. Is there a transit route that you would use to commute by public transit? ☐ Y ☐ N

b. If not, please explain:

4. If you drive alone, which, if any, of the following benefits would encourage you to take alternative forms of transportation? (check all that apply)

☐ Vanpool/carpool incentives

☐ Free/inexpensive shuttle

☐ Pre-tax transit checks

☐ Free public transit benefit

☐ Parking cash-out
(reimbursement to give up your parking spot)

☐ Subsidized bicycle purchase

☐ Improved transit options

☐ Improved bike routes/conditions

☐ Improved walking routes/conditions

☐ Better information about my
commute options

☐ Telecommuting option

☐ Other_____

5. Other comments?

Appendix D:

Government-Generated Solid Waste Methodology

Emissions from the waste sector are an estimate of methane generation that will result from the anaerobic decomposition of all organic waste sent to landfill in the base year. It is important to note that although these emissions are attributed to the inventory year in which the waste is generated, the emissions themselves will occur over the 100+ year timeframe that the waste will decompose. This frontloading of emissions is the approach taken by EPA's Waste Reduction Model (WARM). Attributing all future emissions to the year in which the waste was generated incorporates all emissions from actions taken during the inventory year into that year's greenhouse gas release. This facilitates comparisons of the impacts of actions taken between inventory years and between jurisdictions. It also simplifies the analysis of the impact of actions taken to reduce waste generation or divert it from landfills.

D.1 Estimating Waste Tonnages from Government Operations

Like most local governments, San Carlos does not directly track the amount of waste generated from its operations. Therefore, to estimate the amount of waste generated, ICLEI worked with Allied Waste, the hauler of waste for San Carlos and the South Bayside Waste Management Authority (SBWMA). The amount of waste was estimated by compiling pick-up accounts owned by the City. Garbage trucks do not weigh waste at each pick-up, therefore, it is not possible to directly track disposal figures in mass per facility. Mass of waste generation was estimated using volumetric container size (gallons, yards, etc.) data, along with pick-up frequency and average fill of containers. These data produced a comprehensive annual volumetric figure, which was then converted to mass using standard conversion factors supplied by the California Integrated Waste Management Board (CIWMB). Estimated waste *generation* was converted to final *disposal* (quantity sent to landfill) by applying average waste diversion percentages for each account. Where applicable, self-haul waste (waste brought directly from the local government to landfills) was included as part of this total.

D.2 Emissions Calculation Methods

As some types of waste (e.g., paper, plant debris, food scraps, etc.) generate methane within the anaerobic environment of a landfill and others do not (e.g., metal, glass, etc.), it is important to characterize the various components of the waste stream. Waste characterization for government-generated solid waste was estimated using the CIWMB's 2004 statewide waste characterization study.²⁶

Most landfills in the Bay Area capture methane emissions either for energy generation or for flaring. EPA estimates that 60 percent to 80 percent²⁷ of total methane emissions are recovered at the landfills to which the City sends its waste. Following the recommendation of LGOP, ICLEI adopted a 75 percent methane recovery factor.

Recycling and composting programs are reflected in the emissions calculations as reduced total tonnage of waste going to the landfills. The model, however, does not capture the associated emissions reductions in “upstream” energy use from recycling as part of the inventory.²⁸ This is in-line with the “end-user” or “tailpipe” approach taken throughout the development of this inventory. It is important to note that, recycling and composting programs can have a significant impact on greenhouse gas emissions when a full lifecycle approach is taken. Manufacturing products with recycled materials avoids emissions from the energy that would have been used during extraction, transporting and processing of virgin material.

D.2.1 Methane Commitment Method

CO₂e emissions from waste disposal were calculated using the methane commitment method outlined in the EPA WARM model. This model has the following general formula:

$$\text{CO}_2\text{e} = \text{W}_t * (1-\text{R})\text{A}$$

Where:

W_t is the quantify of waste type “t”

R is the methane recovery factor,

A is the CO₂e emissions of methane per metric ton of waste at the disposal site (the methane factor)

While the WARM model often calculates upstream emissions, as well as carbon sequestration in the landfill, these dimensions of the model were omitted for this particular study for two reasons:

This inventory functions on an end-use analysis, rather than a life-cycle analysis, which would calculate upstream emissions), and this inventory solely identifies emissions sources, and no potential sequestration “sinks.”

26 CIWMB Waste Characterization Study-Public Administration Group available at <http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.aspx>.

27 AP 42, section 2.4 Municipal Solid Waste, 2.4-6, <http://www.epa.gov/ttn/chief/ap42/index.html>

28 “Upstream” emissions include emissions that may not occur in your jurisdiction resulting from manufacturing or harvesting virgin materials and transportation of them.

Appendix E:

Conducting a Monitoring Inventory

The purpose of this appendix is to assist City staff in conducting a monitoring inventory to measure progress against the baseline established in this inventory report. Conducting such an inventory represents milestone five of the Five-Milestone process, and allows a local government to assess how well it is progressing toward achieving its emissions reduction targets.

This inventory was conducted by ICLEI in conjunction with Brian Moura, Assistant City Manager at San Carlos, who served as the lead data gathering coordinator for the inventory. To facilitate a monitoring inventory, ICLEI has documented all of the raw data, data sources, and calculation methods used in this inventory. Future inventories should seek to replicate or improve upon the data and methods used in this inventory. Wherever possible, however, ICLEI strongly recommends institutionalizing internal data collection in order to be able to meet the recommended methods outlined in LGOP.

E.1 ICLEI Tools for Local Governments

ICLEI has created a number of tools for San Carlos to use to assist them in future monitoring inventories. These tools were designed specifically for the Silicon Valley Climate Protection Partnership, and comply with the methods outlined in LGOP. These tools are designed to work in conjunction with LGOP, which is, and will remain, the primary reference document for conducting an emissions inventory. These tools include:

- A “master data sheet” that contains most or all of the raw data (including emails), data sources, emissions calculations, data templates, notes on inclusions and exclusions, and reporting tools (charts and graphs and the excel version of LGOP reporting tool).
- A copy of all electronic raw data, such as finance records or Excel spreadsheets.
- LGOP reporting tool (included in the master data sheet and in Appendix B) that has all activity data, emissions factors, and methods used to calculate emissions for this inventory.

- Sector-specific instructions that discuss the types of emissions, emissions calculations methods, and data required to calculate emissions from each sector, as well as instructions for using the data collection tools and calculators in the master data sheet.
- The appendices in this report include detailed methodologies for calculating emissions from Scope 3 employee commute and government-generated solid waste, as well as two versions of the employee commute survey.

It is also important to note that all ICLEI members receive on-demand technical assistance from their ICLEI liaison, which local staff should feel free to contact at any point during this process.

E.2 Relationship to Other Silicon Valley Climate Protection Partnership Inventories

While the emissions inventories for the 27 participating local governments were conducted simultaneously using the same tools, a local government operations inventory is based on data specific to each local government's operations. For this reason, data must be collected internally within each local government, and the availability of data (and thus emissions estimation methods) will vary between local governments.

That said, local governments in the Silicon Valley Climate Protection Partnership may benefit by cooperating during the re-inventorying process. For example, by coordinating inventories, they may be able to hire a team of interns to collectively perform the inventories – saving money in the process. In addition, local staff may be able to learn from each other during the process or conduct group training sessions if necessary. As a whole, the Silicon Valley Climate Protection Partnership provides the basis for a continuing regional platform for climate actions, and ICLEI recommends taking advantage of this opportunity during all climate actions, including conducting future greenhouse gas emissions inventories.

E.3 Improving Emissions Estimates

One of the benefits of a local government operations inventory is that local government staff can identify areas in their current data collection systems where data collection can be improved. For example, a local government may not directly track fuel consumption by each vehicle and instead will rely upon estimates based upon VMT or purchased fuel to calculate emissions. This affects both the accuracy of the emissions estimate and may have other implications for government operations as a whole.

During the inventory process, ICLEI and local government staff identified the following gaps in data that, if resolved, would allow San Carlos to meet the recommended methods outlined in LGOP in future inventories.

- Direct tracking of refrigerants recharged into stationary HVAC and refrigeration equipment by refrigerant type

- Direct tracking of fire suppressants recharged into fire suppression equipment by suppressant type
- Direct tracking of refrigerants recharged into vehicles in the vehicle fleet by refrigerant type
- Odometer readings of individual vehicles (to calculate vehicle miles traveled)
- Improved mechanisms for tracking and storing data on fuel consumption per fuel type and department if possible
- Fuel consumption by mobile equipment
- Fuel consumption by back-up generators
- Government generated waste data by ton and facility (not relying as much on volumetric data – see Appendix D.1).

ICLEI encourages staff to review the areas of missing data and establish data collection systems for this data as part of normal operations. In this way, when staff are ready to re-inventory for a future year, they will have the proper data to make a more accurate emissions estimate.

E.4 Conducting the Inventory

ICLEI recommends the following approach for Silicon Valley Partnership local governments that wish to conduct a monitoring inventory:

Step 1: Identify a Climate Steward

This steward will be responsible for the jurisdiction’s climate actions as a whole and could serve as an ICLEI liaison in all future climate work. In the context of a monitoring inventory, the steward will be responsible for initiating discussions on a new inventory.

Step 2: Determine which Sectors to Inventory

There are many ways to determine which sectors apply to a local government’s operations, but the easiest to review will be LGOP Standard Report, which is located both in Appendix B and in the master data sheet. This document clearly delineates which sectors will need to be inventoried within a local government’s operations and which LGOP sectors do not apply to a jurisdiction.

Step 3: Gather Support: Identify Data Gathering Team and Leads

Coordination and acceptance among all participating departments is an important factor in coordinating a successful inventory. To that end, the inventory coordinator should work with the city/town/county administrator to identify all staff who will need to be part of the inventory. To facilitate this process, ICLEI has documented all people associated with the inventory in the master data sheet—these names are located in the final completed data form for each sector. Once this team has been identified, the inventory coordinator should hold a kickoff meeting with the

administrator, all necessary staff, and relevant department heads which clearly communicates the priority of the inventory in relationship to competing demands. At this meeting, the roles of each person, including the inventory coordinator, should be established.

Step 4: Review Types of Emissions and Available Methodologies for Applicable Sectors

Local staff should then review LGOP and the instructions documents provided through this inventory to better understand the types of emissions for each sector (for example, within Mobile Emissions, CO₂ emissions and CH₄/N₂O emissions represent two different data requirements and emissions calculations methodologies). Each emissions type may have more than one possible estimation methodology, and it is important that the inventory coordinator understands all possible methodologies and be able to communicate this to all parties assisting in the data gathering.

Step 5: Review Methodologies Used for the 2005 Inventory to Determine Data to Collect

In order to duplicate or improve upon the methods used in this inventory, local staff should again review the methods used for this inventory—these methods are again located in Appendix B—and within the master data sheet. These methods reflect the data limitations for each local government (as many local governments could not obtain data necessary to meet the recommended methods in LGOP). Wherever possible, these methods should be duplicated or, if it is possible, replaced with the recommended methods outlined in LGOP. Using these methodologies, staff will determine what data needs to be collected and communicate this effectively to the data gathering team.

Step 6: Begin Data Collection

With the exception of electricity and natural gas for stationary sources, all data collection will be internal. To obtain stationary source energy consumption data, staff will need to contact the ICLEI representative to determine who the contact is for PG&E data (other utilities will need to be contacted directly).

Step 7: Use the Data Forms as a Resource During Data Gathering

A number of questions will come up during the data gathering process that may be difficult to answer. ICLEI has attempted to capture all of the questions that arose during the 2005 inventory and how they were addressed through the master data sheet. Within the master data sheet, staff should review the raw data, working data, and completed data forms to review how raw data was converted to final data, and also to review any notes taken by ICLEI staff during the 2005 inventory process.

For example, reviewing the stationary sources PG&E data within the master data sheet will allow local staff to review how individual accounts were separated into each category and which counts may have been excluded from the inventory.

Step 8: Use Emissions Software to Calculate Emissions

ICLEI has provided the staff lead on the 2005 inventory with a backup of the software used to calculate many of the emissions included in this report. Staff should use this (or more current ICLEI software) to calculate emissions by inputting the activity data into the software. ICLEI staff and ICLEI trainings are available to assist local government staff in calculating emissions.

Step 9: Report Emissions

The master data sheet also contains the LGOP Standard Reporting Template, which is the template adopted by ARB as the official reporting template for government operations emissions inventory. This tool, as well as the charts and graphs tool provided by ICLEI can be used to report emissions from government operations. Also, local government staff should utilize this narrative report as guide for a narrative report if they so choose.

Step 10: Standardize and Compare to Base Year

Conducting a monitoring inventory is meant to serve as a measuring point against the baseline year represented in this report. In order to make a more accurate comparison, it is necessary to standardize emissions from stationary sources based upon heating and cooling degree days (staff can use a ratio of heating /cooling degree days to standardize across years).

In addition, it is important, when comparing emissions across years, to clearly understand where emissions levels may have changed due to a change in methodology or due to excluding an emissions source. For example, if the default method was used to estimate refrigerant leakage in 2005 (this method highly overestimates these emissions), and the recommended method was available in a monitoring year, this would appear as a dramatic reduction in these emissions even though actual leaked refrigerants may be similar to the base year. Changes such as these should not be seen as progress toward or away from an emissions reduction target, but emissions estimates should be adjusted to create as much of an apples-to-apples comparison as possible. If such an adjustment is not possible, staff should clearly note the change in methodology between years when comparing emissions.

Appendix F:

2009 Annual Report to Council on Green Programs and Climate Change

CITY OF SAN CARLOS

COUNCIL/RDA MEETING DATE: June 8, 2009

ITEM TITLE: Report to Council – Annual Report on Green Programs and Climate Change

Background

For a number of years, the City of San Carlos was active in green programs including recycling (at City Hall and in the community) and in one of the early solar projects in the County. In May 2007, the City Council discussed and approved an expansion of activities in the Green Programs and Climate Change arenas. Since that time, Staff has prepared annual updates for the City Council on these activities. It is now time to review some of the highlights of our work in this area during the past year.

Multi-Tiered Approach

Due to both the scope of the challenge in this area and the City's challenging General Fund Budget deficit, our work in this area has involved both work at City Hall as well as partnering with other groups in the City (Chamber of Commerce, Local Businesses and San Carlos Green), the County (SBWMA, Recycle Works, Green Business Program, San Mateo County Energy Watch, C/CAG and Local Utilities), Silicon Valley (Joint Venture: Silicon Valley), the Bay Area (ABAG, Bay Area Regional Air Quality Board) and Other Resources (ICLEI). The result continues to be a very low cost program that has produced a number of successes one that has received a number of inquiries from other cities around the State as a potential model for their efforts.

Highlights from the City's Green Programs & Climate Protection Projects

While this is not a complete list, here are some of the highlights of our work in the Green Programs and Climate Protection area over the past year:

City of San Carlos Programs

During the past year, the City continued its work in the area of Green Programs and Climate Change. Many accomplishments occurred in the past year including:

- Green Section of City Web Site and Green eNewsletters
- Energy Efficiency Audits of City Buildings – ABAG Energy Watch and PG&E
- Significantly Upgraded the Construction & Demolition (C&D) Recycling Program
- 2 Year Extension of the City's Good Faith Effort program to meet State recycling requirements under AB 939 and SB 1018
- Hired a Green Janitorial Contractor for City Buildings
- Creek Cleanup & Material Pick Up Days (September 2008)

- City Council Approval of Green Housing Development at Cherry & Chestnut
- Monthly Composting Workshops with Recycle Works & San Carlos Green
- Completion of Community-Wide Greenhouse Gas Inventory
- Work on Agency Greenhouse Gas Inventory (completion in Summer 2009)
- Staffing the San Carlos Climate Action Plan Subcommittee
- Work with Countywide, Regional and Local Programs

South Bayside Waste Management Authority (SBWMA)

The City works on Solid Waste (Garbage and Recycling) programs as well as operation of the Shoreway Transfer Station and Recyclery in San Carlos with the SBWMA. Accomplishments:

- City eWaste Events (July & November 2008); Next Event in August 2009
- Continued success of Cell Phone & Battery Recycling Started in San Carlos (now over 50,000 pounds of materials collected in service area)
- Compost Giveaways at Crestview Park
- City Council Selection of Norcal Waste Systems – Enhanced Solid Waste Services
- Approval of Use Permit to Rebuild & Enhance Shoreway Transfer Station & Materials Recovery Facility (MRF)
- Green Design Features in New Shoreway Center to Qualify for LEED Certification
- Selection of South Bay Recycling to Operate Install Equipment & Operate Single Stream Recycling Facility on Shoreway Road
- Progress on Shoreway Bonds to Finance Upgrade of Shoreway Transfer Station & Materials Recovery Facility (MRF)
- Launched Weekly Food Scraps & Yard Clippings Program (Feed the Pail, Feed the Planet) in March 2009
- Exploring Mandatory Commercial Recycling Program in San Carlos ahead of State Requirements from California Air Resources Board (CARB)
- Considering Household Waste (HHW) Collection Program in San Carlos
- Planning for Norcal’s “Recycling Blitz” for Commercial & Multi-Family Residential Accounts in San Carlos to Accelerate Recycling Activity (launches next June)

Chamber of Commerce & San Carlos Business Community

The Chamber of Commerce formed a Green Business Committee that is meeting monthly and developing a program for local businesses. Accomplishments:

- Monthly “Green Scene” column in the Chamber of Commerce newsletter
- Spotlighting San Carlos Businesses with Green Practices in the Chamber Newsletter
- Green Business Trade Show with Sustainable San Mateo County
- Established the Green Business of the Year Awards at the Annual Chamber Dinner
- Working with the City to Explore a Mandatory Commercial Recycling Program
- **REI San Carlos** – Installed largest Solar Power System in the City
- **A+ Japanese Auto** – First Silicon Valley Auto Facility to offer Plug-In conversions of Hybrid Vehicles including the Toyota Prius
- **Kelly Moore Paint** – Certified Green Business, Introduced Green Paints and Product Lines & Won Green Awards
- **Level 3 Communications** – Green modifications to their site saved thousands of gallons of water each month and Green Business of the Year (Large)
- **Held & Lau DDS** – Certified Green Business & Green Business of the Year (Small)

San Carlos Green (Community Non-Profit Group - San Carlos Residents)

San Carlos Green is a community based non-profit group. They are leading a group of San Carlos resident volunteers focused on green activities in the community. Key Programs include:

- Continued work on Vista Park with Parks and Recreation Department & local residents
- San Carlos Green eWaste Event (October 2008)
- Involvement in Program Marketing & Design for Weekly Food Scraps Program
- Community outreach at events including Hometown Days and Art & Wine Faire

San Mateo County Green Business Program (San Carlos Businesses)

County Supervisor Mark Church and San Mateo County Recycle Works brought the Bay Area Green Business Program to San Carlos in the summer of 2007. Since then:

- 20 San Carlos firms have earned Certified Green Business status
- One of every 3 Certified Green Businesses in the County are in San Carlos
- 30 additional San Carlos firms have now applied for Certified Green Business status
- **Piacere Restaurant & Pebbles-Piazza Floor and Windows** – 2 Certified Green Businesses in San Carlos – were featured in a video that encourages more small businesses to become Certified Green Businesses in San Carlos and San Mateo County
- The program is exploring a Certified Green Program for local schools
- Also under development is a way to calculate the Carbon Footprint reduction the program is having by business and by City

San Mateo County Energy Watch

This is a new program started by San Mateo County and their Recycle Works group. It replaces ABAG's Bay Area Energy Watch program in this county and will offer several excellent programs to San Carlos and its residents and businesses. Projects include:

- Transfer of the ABAG Energy Watch audits of 4 key City Buildings (City Hall, Library, Youth Center, Adult Community Center) to SMC Energy Watch for potential energy saving projects, rebates and implementation
- Referral of 3 Green Business Program applicants in San Carlos to energy efficiency firms to help with efforts to modernize, save energy and cut operating costs
- A new program for local businesses to become more energy efficient that will be introduced to the San Carlos business community through the Chamber of Commerce's Green Committee
- Future programs that may include residential energy audits and residential and business energy efficiency programs, rebates and funding

Joint Venture: Silicon Valley Climate Protection Initiative

Joint Venture: Silicon Valley's Climate Protection Initiative for all 42 cities and counties in Silicon Valley continues to be a valuable resource. The Assistant City Manager is a member of the program's Executive Committee. Accomplishments:

- Assisting with the completion of the Community-wide Greenhouse Gas (GHG) Inventory along with ICLEI, Bay Area Air Quality Management District (BAAQMD)
- Discount program for the calculation of Agency GHG inventories coordinated with C/CAG, ICLEI and BAAQMD

- Updates on Climate Change legislation and regulations affecting cities including AB 32 implementation, SB 375, AB 811 and SB 279 with support from the League of California Cities and CSAC
- Overviews on Green technologies and options including Solar Systems & Energy Efficiency
- Exploring Solar Power Purchase Agreements (PPAs) for City Buildings
- Pilots of LED Streetlights and Safety lighting in several cities

Climate Action Plan

Using a \$75,000 grant from the Bay Area Air Quality Management District (BAAQMD), the City was able to integrate Greenhouse Gas emission reduction and climate change strategies into the Environmental Management Element of the General Plan as well as develop a Climate Action Plan that will be integrated with the upcoming City General Plan. The City worked with a three member Climate Action Plan Subcommittee of the General Plan Advisory Committee (Don Cook, Suzanne Emerson and Michelle Margiotta) to develop the first Climate Action Plan (CAP) for San Carlos. The effort was led by Deborah Nelson, Planning Manager with support from the Assistant City Manager Brian Moura and Michael McCormick and Jillian Rich from PMC, a planning consulting firm. Results to date:

- The CAP subcommittee worked through an initial list of 125 measures to reduce the Carbon Footprint in San Carlos
- A Community Workshop on the Climate Action Plan was held last September and residents helped fine tune the list of proposed measures
- The Draft Climate Action Plan was completed and posted on the City's Web Site. It includes 21 reduction goals and 39 reduction measures aimed at reducing the City's GHG levels to 15% below the 2005 levels by the year 2020.
- High interest in the San Carlos Draft plan has led to presentations on the plan to groups including city and county officials in Monterey County on Earth Day and the Silicon Valley Climate Protection Task Force and the BAAQMD Climate Action Leadership Summit
- Recently the San Carlos Climate Action Plan won an Award of Merit from the Northern California Chapter of the American Planning Association (APA)
- The development and public involvement portion of the work on the CAP will soon be featured as a case study by the Institute of Local Government (ILG).
- The Draft Climate Action Plan will be reviewed by the Planning Commission and City Council this July prior to adoption, in conjunction with the General Plan, in October.

The Year Ahead

San Carlos has accomplished quite a bit in the Green Programs and Climate Change area since this program was expanded in 2007. The result has been significant progress towards the Council's direction that we pursue a greener future for San Carlos. Staff looks forward to working with residents, businesses and the partners mentioned in this report to continue to progress in this area.

Respectfully submitted,

Approved for submission by:

Brian Moura, Assistant City Manager

Mark Weiss, City Manager

RESOLUTION NO. 2009-080

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN CARLOS ADOPTING THE CLIMATE ACTION PLAN

WHEREAS, in June 2007 the City Council of the City of San Carlos approved a work program and process for an update of the City of San Carlos 1992 General Plan, Specific Plans and subsequent amendments including the 2001 Housing Element, the 2005 Circulation and Scenic Highways Element (including the 2008 amendments); and

WHEREAS, to augment and inform the Goals, Policies and Actions of the 2030 General Plan Environmental Management Element and other Elements of the General Plan, the City had prepared a Climate Action Plan (CAP); and

WHEREAS, the City Council of the City of San Carlos appointed a General Plan Advisory Committee ("GPAC") to advise the City Council regarding the General Plan Update and over an 18 month period beginning in October 2007, the GPAC held 46 public meetings including: 26 regular meetings and 20 subcommittee meetings where in depth deliberation and formulation of a 2030 General Plan was conducted; and

WHEREAS, comments and participation were sought at one Building Community Forum, two Community Forum Speaker Events, two Housing Public Forums, one Youth Visioning Workshop, one Community Visioning Workshop, one Community Land Use Workshop, and one Climate Action Plan Public Forum; and

WHEREAS, the Planning Commission held four Study Sessions and two public hearings at significant milestones in the process of preparation of the 2030 General Plan; and

WHEREAS, the City Council held four Study Sessions at significant milestones in the process of preparation of the 2030 General Plan and one public hearing on the Final Environmental Impact Report, the 2030 General Plan and the Climate Action Plan; and

WHEREAS, comments and participation were sought from the public and interested and affected agencies including City/County Association of Governments (C/CAG), the Airport Land Use Committee, the Bay Area Air Quality Management District (BAAQMD), the Air Resources Board, the County of San Mateo, City of Belmont and City of Redwood City, all school districts, the Local Agency Formation Commission (LAFCo), the Association of Bay Area Governments (ABAG), the Office of the Attorney General of the State of California and a number of other agencies, individuals and experts; and

WHEREAS, the San Carlos Climate Action Plan was evaluated as a component of the Environmental Impact Report for the "Project" including the 2030 General Plan and Climate Action Plan; and

WHEREAS, pursuant to the California Environmental Quality Act ("CEQA"), the City of San Carlos City Council: certified a Final Environmental Impact Report ("FEIR") for the San Carlos 2030 General Plan and the Climate Action Plan; made findings relating to significant impacts, mitigation measures and alternatives, and adopted a Statement of Overriding Considerations; and adopted a Mitigation Monitoring and Reporting Program; and

WHEREAS, the Planning Commission held study sessions on July 6, 2009 and July 20, 2009 to discuss and receive public comments on the proposed San Carlos 2030 General Plan and Climate Action Plan and conducted a public hearing on the San Carlos 2030 General Plan and Climate Action Plan on September 21, 2009 to consider a recommendation to the City Council regarding adoption of the San Carlos 2030 General Plan and the Climate Action Plan; and

WHEREAS, the City Council held a study session on August 10, 2009 to discuss and receive public comments on the proposed San Carlos 2030 General Plan and Climate Action Plan and conducted a public hearing on the San Carlos 2030 General Plan and Climate Action Plan on October 12, 2009 to consider adoption of the San Carlos 2030 General Plan and the Climate Action Plan.

NOW, THEREFORE, BE IT FOUND, DETERMINED AND RESOLVED BY THE CITY COUNCIL THAT:

1. Findings

The City Council makes the following findings:

- a. The Climate Action Plan informed the 2030 General Plan and Goals, Policies and Actions addressing greenhouse gas emissions and adaptation strategies which are contained throughout the 2030 General Plan including all of the seven elements mandated by Section 65303 of the Government Code; land use, circulation, housing, conservation, open space, noise and safety elements. These mandatory elements and two optional elements, Environmental Management and Parks and Recreation are represented in the 2030 San Carlos General Plan as: Land Use Element, Housing Element, Circulation and Scenic Highways Element, Environmental Management Element, Parks and Recreation Element, Community Safety and Services Element and Noise Element.
- b. The Climate Action Plan provides the strategies for San Carlos to reduce greenhouse gas emissions consistent with the direction of the State of California via AB32 and Governor's Order S-03-05 and Public Resources Code section 21083.3.
- c. The Climate Action Plan serves as a threshold of significance, through reference in the 2030 General Plan, within the City of San Carlos for climate change and as such is consistent with the direction of the California Attorney General opinion (Climate Change, CEQA and General Plans, Revised March 6, 2009) and Public Resources Code 21083.3.

2. Adoption

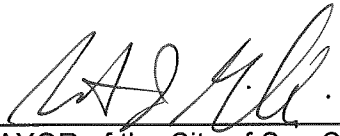
- a. The City Council adopts the 2009 Climate Action Plan, as amended, as set forth in Exhibit A.

Passed and adopted as Resolution of the City Council of the City of San Carlos at a regular meeting thereof held on the 12th day of October, 2009, by the following vote:

AYES, COUNCILMEMBERS: Ahmad, Grassilli, Lewis, Royce

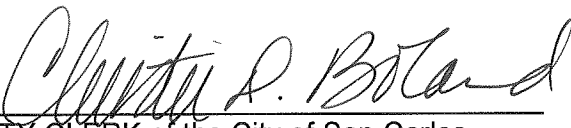
NOES, COUNCILMEMBERS: Grocott

ABSENT, COUNCILMEMBERS: None.



MAYOR of the City of San Carlos

ATTEST:



CITY CLERK of the City of San Carlos

EXHIBIT A

CLIMATE ACTION PLAN, found at the following site:

[http://www.epackets.net/meeting.aspx?cabinet=PUBLISHED MEETINGS&ftr=0&docid=8749389](http://www.epackets.net/meeting.aspx?cabinet=PUBLISHED_MEETINGS&ftr=0&docid=8749389)

as the following pdf documents:

Adopt the Climate Action Plan (Attachment 4). - San Carlos Climate Action Plan - Attachment 4, Exhibit A

Adopt the Climate Action Plan (Attachment 4). - Initial Cost Calculations - Attachment 4, Appendix A

Adopt the Climate Action Plan (Attachment 4). - GHG Emissions Reduction Analysis Calculations - Attachment 4, Appendix B

Adopt the Climate Action Plan (Attachment 4). - Attachment 4 Appendix C.pdf

Adopt the Climate Action Plan (Attachment 4). - Attachment 4 Appendix D.pdf

Adopt the Climate Action Plan (Attachment 4). - San Carlos Municipal Greenhouse Gas Emission Inventory - Attachment 4, Appendix E

and as amended by the City Council on 10-12-09 as follows:

Energy Use Measure 3. Adopt a green building standard for all new development and major remodels.

The City Council selected 3.1b (and not 3.1a) –

Energy Use measure 3.1b. Develop a green building ordinance that is consistent with that of neighboring jurisdictions or that is custom to the City of San Carlos that requires a Green Point, LEED or equivalent green building certification per development category

Energy Use measure 2. Improve residential energy efficiency

The City council selected 2.1 with Tier 1 application of 15% over Title 24 requirements.

Energy Use measure 2.1. Establish energy efficiency standards for new construction and remodel projects that exceed the State's Title 24 energy standards.

OCTOBER 2009
Executive Summary

City of San Carlos

Climate Action Plan

Prepared by the City of San Carlos Planning Department and the
General Plan Advisory Committee (GPAC) Climate Action Plan Subcommittee



City of San Carlos Planning Department
600 Elm Street
San Carlos, CA 94070



City of San Carlos Climate Action Plan - adopted by the City of San Carlos City Council, Resolution 2009-080, October 12, 2009.

ACKNOWLEDGEMENTS

Many individuals and organizations contributed to the completion of this report by providing guidance, data, and other general information. The following people helped in this endeavor to quantify greenhouse gas emissions and develop a Climate Action Plan for the City of San Carlos community.

General Plan Advisory Committee, Climate Action Plan Subcommittee

Suzanne Henderson Emerson
Don Cook, PE
Michelle Margiotta

City of San Carlos

Brian Moura, Assistant City Manager
Al Savay, Community Development Director
Deborah Nelson, Planning Manager

Climate Action Plan Coordination and Report Preparation



500 12th Street, Suite 240
Oakland, CA 94607

Other Agencies Providing Funding and Technical Support

Association of Bay Area Governments
Bay Area Air Quality Management District
ICLEI – Local Governments for Sustainability
Joint Venture Silicon Valley
Pacific Gas and Electric
Metropolitan Transportation Commission
City/County Association of Governments of San Mateo

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The following is a list of common conversions used throughout the San Carlos Climate Action Plan. The 'City of San Carlos – General Greenhouse Gas Conversions' are average estimates of the greenhouse gases (GHGs) produced by a unit of natural gas, electricity, and VMT within the City of San Carlos in calendar year 2005. The purpose of these conversion estimates is to provide an estimate for the reader to visualize the GHG equivalent of activities within the City. The calculations within the Climate Action Plan will not always match the average conversion estimates below due to variable source information; however these estimates are generally appropriate. For more information on greenhouse gas calculations, please see Appendices B, C, and E.

Quantity	Value	Notes
Standard Unit Conversions		
1 pound (lb)	0.0004536 metric tons (tonnes)	Engineering Standard
1 short ton (ton)	0.9072 metric tons (tonnes)	Engineering Standard
1 metric ton (tonne)	1.1023 short tons (tons) 2,204.62 pounds (lbs)	Engineering Standard
1 kilowatt hour (kWh)	3,412 Btu (Btu)	Engineering Standard
1 therm	100,000 Btu (Btu)	Engineering Standard
City of San Carlos – General Greenhouse Gas Conversions for baseline 2005 calculations		
1 kilowatt hour (kWh)	0.492859 lbs Co2e	PG&E 2005 emissions factor certified by the California Climate Action Registry
1 MMBtu	53.05 kilograms (kg) CO2e	PG&E CO2e emissions factor for delivered natural gas, certified by the California Climate Action Registry and CEC
1 Vehicle Mile Traveled (VMT)	1.077 pounds (lbs) CO2e	Average estimate calculated by dividing total CO2e derived from EMFAC and CACP by total VMT. Individual calculations may vary from this average coefficient based on model year and vehicle class.
1 short ton landfilled waste	0.277 metric tons CO2e	Average estimate calculated by dividing total emissions from landfilled waste derived from EPA's WARM model and CACP by total tons landfilled. Individual calculations may vary from this average coefficient based on type of waste landfilled and waste management practices.

Executive Summary

The City of San Carlos Climate Action Plan (hereafter referred to as “Plan”) serves as a guiding document to identify ways in which the community and City can reduce greenhouse gas emissions and adapt to the inevitable effects of climate change. Specifically, the Plan does the following:

- ✚ Identifies sources of greenhouse gas emissions caused from actions within the City of San Carlos municipal boundary and estimates how these emissions may change over time;
- ✚ Provides energy use, transportation, land use, and solid waste strategies to bring San Carlos’ greenhouse gas emissions levels to 15% below 2005 levels by 2020 and 35% below 2005 levels by 2030;
- ✚ Mitigates the impacts of San Carlos on climate change (by reducing greenhouse gas emissions consistent with the direction of the State of California via AB32 and Governor’s Order S-03-05 and Public Resources Code section 21083.3). The CEQA Guidelines encourage the adoption of policies or programs as a means of addressing comprehensively the cumulative impacts of projects. (See CEQA Guidelines, §§ 15064, subd. (h)(3), 15130, subd. (c).)
- ✚ Allows the greenhouse gas emissions inventory and Climate Action Plan to be updated every five years and respond to changes in science, effectiveness of emission reduction measures and federal, state, regional or local policies to further strengthen the City’s response to the challenges of climate change.
- ✚ Provides substantial evidence that the emission reductions estimated in the Climate Action Plan are feasible.
- ✚ Serves as the programmatic tiering document for the purposes of CEQA within the City of San Carlos for climate change, by which applicable developments within the City will be reviewed. If a proposed development is consistent with the emission reduction and adaptation measures included in the Climate Action Plan and the programs that are developed as a result of the CAP, the project would be considered to have a less than significant impact on climate change and emissions consistent with the direction of the California Attorney General (Climate Change, CEQA and General Plans, Revised March 6, 2009) and Public Resources Code 21083.3.
- ✚ Outlines ways in which the City can prepare for and adapt to the consequences of climate change; and,
- ✚ Discusses the various outcomes of reduction efforts and how these reduction efforts can be implemented and advertised;

The strategies to reduce greenhouse gas emissions are organized into 21 reduction measures with various components to each reduction measure. Measures are then separated into energy use, transportation and land use, and solid waste categories.

The reduction measures are projected through 2030 with 2020 serving as an interim target. The Climate Action Plan Subcommittee ("Subcommittee"), the community of San Carlos, and City staff chose the reduction measures through a collaborative process. Each reduction measure is analyzed with estimates of initial monetary cost to the City and reduction in greenhouse gas emissions, culminating in an overall recommendation of implementation priority.

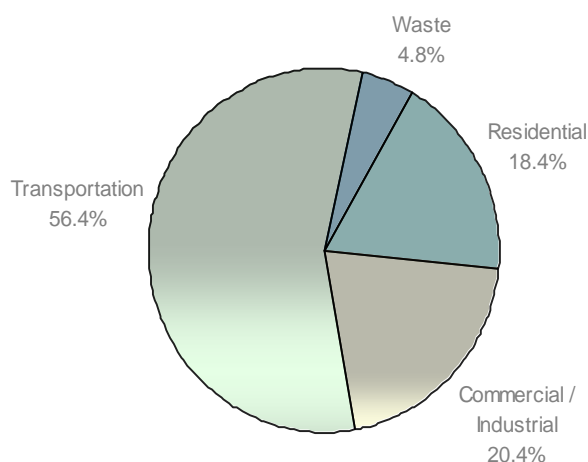
This report is a significant landmark in San Carlos' proactive approach to reducing and adapting to the effects of climate change. It builds upon residents' existing commitment to sustainability by formalizing the process of measuring and addressing greenhouse gas emissions. It also breaks new ground by being developed with the purpose of incorporating the outlined emission reduction strategies as components of the General Plan Update and corresponding Environmental Impact Report. By integrating climate action into the General Plan, San Carlos will ensure that the issue becomes an integral part of the planning process.

"The City of San Carlos will work with residents and businesses as well as in conjunction with neighboring cities, counties and other agencies interested in this matter to progress on reducing greenhouse gas emissions and to reduce global warming pollution levels."

– The San Carlos Climate Protection Letter

For the full picture of San Carlos' efforts to reduce greenhouse gas emissions and reduce the effects of climate change, please visit www.cityofsancarlos.org. As programs are developed to respond to the emission reduction measures outlined in this Plan, they will be explained and tracked on the City's website. Assistance and involvement from the community (including residents, businesses, schools and government agencies) will be crucial to the success of this Plan's implementation. The San Carlos community should be proud to take part in San Carlos' commitment to sustainability, of which this Climate Action Plan is a part.

Community-Wide Greenhouse Gas Emissions



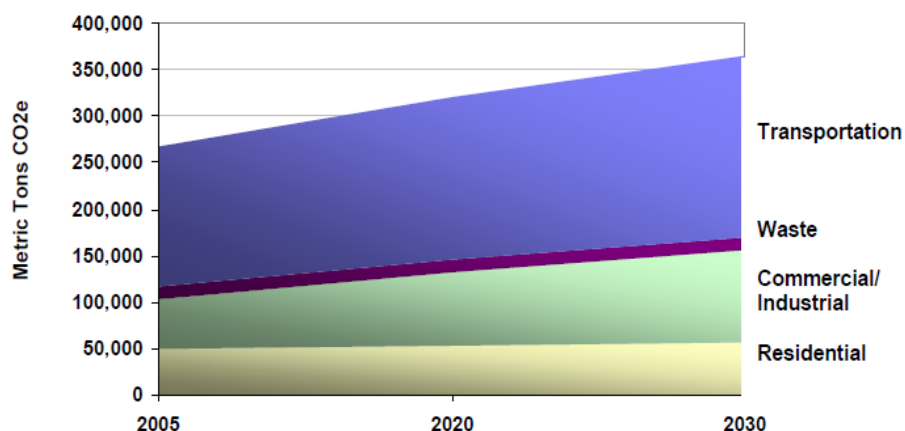
Activities within the jurisdictional boundary of San Carlos within calendar year 2005 caused an estimated 267,237 metric tons of carbon dioxide equivalent (CO₂e) to be released into the atmosphere. The largest source of emissions (56%) was a result of highway and local road vehicular travel.

The emissions from municipal operations are currently contained within the Commercial/Industrial category. A separate municipal greenhouse gas inventory has been developed and included as

Appendix E.

If the community of San Carlos continues with the 2005 pattern of energy consumption, travel, and waste production, the level of greenhouse gas emissions is estimated to increase to 321,519 metric tons per year by 2020 and 365,787 metric tons per year by 2030. These “business-as-usual” forecasts of 20.3% and 36.9% higher than 2005 levels, respectively, are due to estimated increases in consumption, population, households, and commercial activity as outlined in the General Plan buildout scenario.

2030 Greenhouse Gas Emissions Forecast by Sector



Achieving San Carlos' Reduction Target

The Climate Action Plan Subcommittee developed a strategic policy focus to direct the development of the Climate Action Plan and associated emission reduction measures. The policies focus on the following:

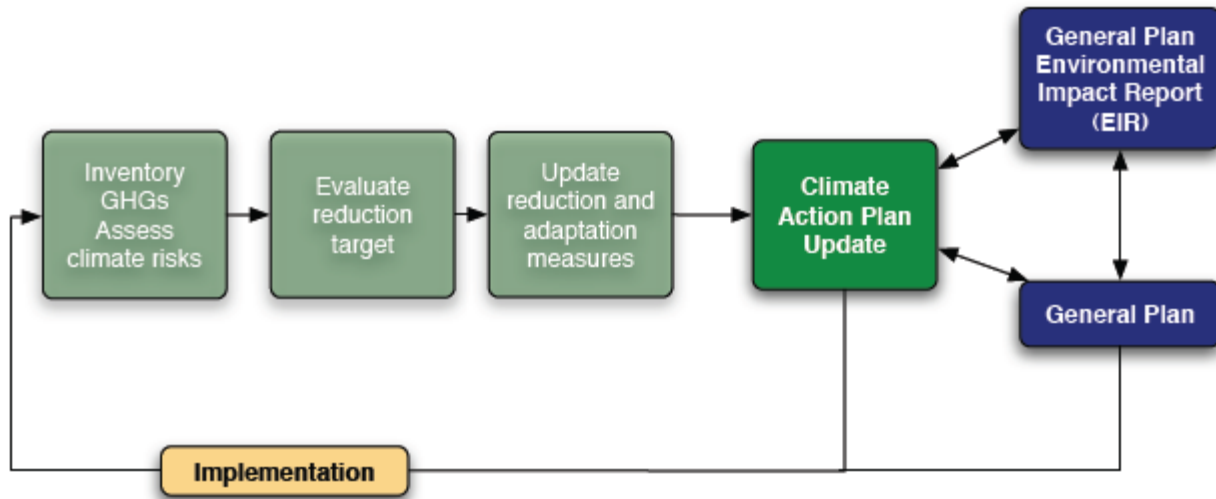
1. Building Efficiency / Site Design
2. Auto Emission Reduction
3. Low Carbon Energy Use
4. Alternative, Non-automotive Travel Modes
5. Waste Reduction Program

The Subcommittee was responsible for reviewing and analyzing strategies aimed at reducing the greenhouse gas emissions from energy consumption, transportation, land use, and solid waste production. Over one hundred possible reduction measures were initially considered. The Subcommittee narrowed this list to 31 measures based on feasibility, cost-effectiveness, and appropriateness to the community. The public then came together at a workshop to form the final 23 reduction measures, which were subsequently condensed into 21. The process of selecting and clarifying San Carlos' reduction measures is explained further in Appendix D.

General Plan Integration

The Climate Action Plan will be updated to analyze new reduction targets and efforts. The General Plan accommodates the Climate Action Plan update process by dynamically referencing sections of the Climate Action Plan instead of concrete text. This will ensure that the City and its planning resources are continuously up to date. The five-year CAP update process and its relation to the General Plan are depicted below.

The Five-year CAP Update Process and its Relation to the General Plan



Energy Use Reduction Measures

The second largest contributor to San Carlos' greenhouse gas emissions (39%) comes from residential, commercial, and industrial energy use in San Carlos. To address this significant cause of greenhouse gas emissions, the following measures were formed:

- ❏ Adopt a green building standard for new development and major remodels.
- ❏ Expand energy saving opportunities to businesses.
- ❏ Create water and waste efficient landscapes.
- ❏ Improve residential energy efficiency.
- ❏ Identify opportunities for on-site renewable energy generation on City and privately-owned property.
- ❏ Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.
- ❏ Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.
- ❏ Encourage tree planting.

Green Building Standards for new development and major remodels.

Energy Use Reduction Measure Highlight

Description: Two green building standard options were analyzed: 1) Provide information on green building certifications and 2) Create a local green building ordinance referencing Leadership in Energy and Environmental Design (LEED), Build It Green (BIG) GreenPoint Rated, or equivalent rating systems.

Emission Reduction: The analysis revealed that San Carlos will save 535.5-11,868 metric tons of carbon dioxide equivalent (CO₂e) per year by 2030 depending on which option was chosen.

These measures were expanded upon and analyzed through various components. The reduction estimates for each measure are structured in a way that if the City discovers a component of the reduction measure is no longer feasible, it can be replaced with another component and still achieve the measure's overall target. All of the measures identified above are expected to save at least 42,369 metric tons of CO₂e per year by 2030.

Transportation and Land Use Reduction Measures

The transportation sector is the largest contributor to greenhouse gas emissions in San Carlos (56%). The majority of these emissions are from vehicles traveling on the length of State Highway 101 running through San Carlos. Transportation and land use are combined into one section because they are highly integrated. In many cases, it requires a change in land use patterns to alter the need for personal automobile use and move towards more fuel efficient vehicles. The transportation and land use measures are as follows:

- ❖ Encourage development that is mixed-use, infill, and higher density.
- ❖ Provide for an education program and stepped up code enforcement to minimize vegetation that degrades access along public rights of way.
- ❖ Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.
- ❖ Increase bike parking.
- ❖ Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.
- ❖ Provide for a shuttle service connecting areas not adequately served by public transit.
- ❖ Increase housing density near transit.
- ❖ Promote car sharing programs.
- ❖ Increase accommodation and promotion of alternatively fueled vehicles and hybrids.
- ❖ Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling, and walking.

Encourage development that is mixed-use, infill, and higher density.

Transportation and Land Use Reduction Measure Highlight

Description: The principles of infill, high density, and mixed-use development lead to decreased vehicle miles traveled and increased neighborhood vitality. They also have multiple social benefits, including: better health, lower infrastructure costs, and increased accessibility.

Emission Reduction: The analysis revealed that San Carlos can save 5,544 metric tons of CO₂e per year from reduced vehicle trips and shared building materials as a result of higher density, mixed-use development.

These measures are estimated to save 14,109 metric tons of CO₂e per year by 2030. As with the energy sector, each measure's portion of the total reduction target is flexible. If a component of a reduction measure becomes infeasible, it can be adjusted as long as the overall measure's target is accounted for.

Solid Waste Reduction Measures

The waste from San Carlos residents and businesses accounts for 4.78% of San Carlos' yearly greenhouse gas emissions, or 12,777 metric tons of CO₂e. While a small portion of overall emissions, the community has a great deal of control over these emissions. The measures to reduce emissions from solid waste are as follows:

- For municipal operations, establish a zero waste policy.
- Make recycling and composting mandatory at public events.
- Increase overall waste diversion by 1% per year.

These reduction measures are estimated to reduce greenhouse gas emission by 6,560.7 metric tons of CO₂e per year by 2030.

Increase overall waste diversion by 1% per year

Solid Waste Reduction Measure Highlight

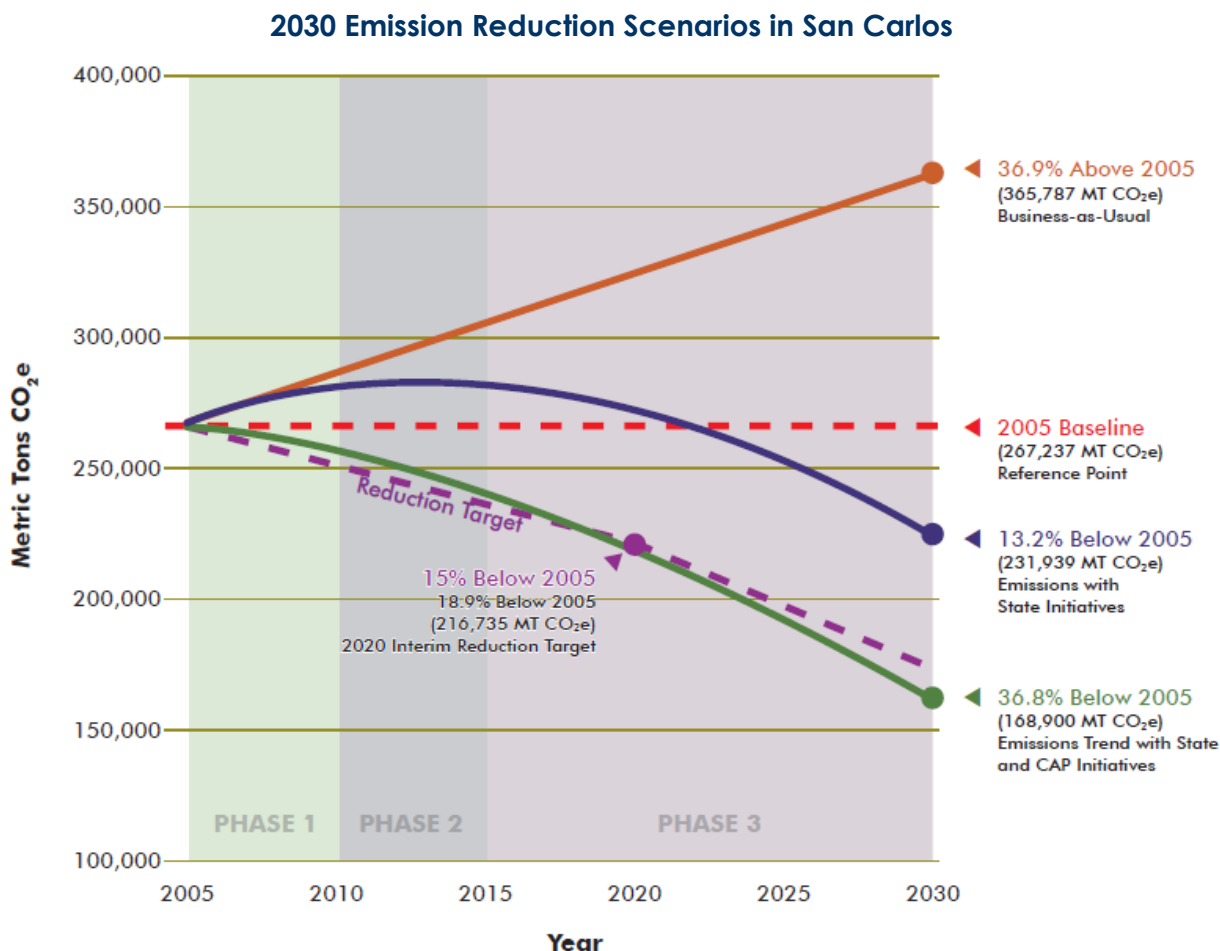
Description: San Carlos will reduce solid waste generation by a minimum of 1% per year. Steps taken to achieve this goal may include increasing the required construction and demolition diversion rate beyond the 50% currently required by the State and providing expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.

Emission Reduction: San Carlos can save at least 6,222 metric tons of CO₂e per year by 2030.

Findings

The quantifiable reduction measures included in this plan are estimated to save at least 63,039 metric tons of CO₂e per year by 2030 when implemented. We are confident that this significant decrease in local emissions, in concert with State initiatives for renewable energy and vehicle efficiency will result in the City meeting, if not exceeding, our emission reduction target of 15% below 2005 levels by 2020 and 35% below 2005 levels by 2030.

It is important to note that while we begin implementation of the measures of this document, emissions will continue to rise due to population growth and consumption trends. This makes our reduction target challenging but feasible; the decrease in per capita emissions as a result of the measures in this Plan will be working against an increase in overall emissions due to population and job growth. This trend is shown in the graph below. The business-as-usual red line is what we can expect without a decrease in per capita emissions, the horizontal dotted line is a representation of constant 2005 emissions rates as a point of reference, and the bottom dotted line is our reduction target. If we look at the difference between our reduction target and business-as-usual projections, we see that the actual reduction needed from business-as-usual to reach our target is actually over 72%.



Possible scenarios for meeting the 2030 targets set forth in this Plan are depicted above and explored in greater detail in the body of this Climate Action Plan. The curved lines in the graph above represent phased implementation of the reduction measures in this Plan as well as State and regional initiatives. As shown through the lower green line above, we expect our 35% reduction target to be achieved through a combination of the reduction measures included in this Plan and State initiatives such as the renewable energy portfolio standard and implementation of recent State legislation. The overall emission reductions anticipated through these efforts are outlined in the table on the following page.

Reduction Target Analysis

		2020 Metric Tons CO ₂ e per year	2030 Metric Tons CO ₂ e per year
Reference Year Business-As-Usual Emissions Projection		321,519	365,787
1	Energy Use Strategies	-24,496	- 42,369
2	Transportation and Land Use Strategies	-12,886	-14,109
3	Solid Waste	-4,815	-6,561
Subtotal – Emissions with CAP		279,342	302,748
4	Renewable Portfolio Standard	- 13,834	- 31,566
5	Pavley I and II	- 34,649	- 91,978
6	Low Carbon Fuel Standard	- 14,124	-10,304
Total – Emissions with CAP and State Programs		216,738	168,900
Base Year 2005 Community Emissions		267,237	267,237
Percent below 2005 Level		18.9%	36.8%

* The reduction potential of new Title 24 requirements have not been technically analyzed.

Implementation

This report lays the groundwork for a more important task ahead – implementation. The 21 reduction measures are crucial to attaining San Carlos' reduction goal of 35% below 2005 levels by 2030. The San Carlos Climate Action Plan is a foundation for this effort that will be revised and built upon for years to come. Reduction measures will continue to evolve as new climate-related technology, policy, and resources become available. That is why an essential part of implementation of this document is reassessment.

It is suggested that the City update the 2005 Community Greenhouse Gas Emissions Baseline Inventory every five years to see how emissions have changed since the 2005 baseline year. These updated reports will be two-pronged, first reporting emissions using present quantification methodology and protocol in order to create a basis of comparison and secondly reporting emissions using an up-to-date methodology and protocol that will likely capture other sources of emissions that we are currently unable to calculate with today's research methodologies and analysis tools. As a result of these updated inventories, this Climate Action Plan and corresponding reduction measures will be revisited. Attention will be shifted to those sectors displaying faster growth rates than others and to those emission reduction measures which are having greater success at reducing emissions with less cost than other measures.

As part of the adaptation element of this plan, it is recommended that the City prepare itself internally for climate change resiliency. A sustainability coordinator among City Staff and established points of contact to inform and collaborate with resident groups, businesses, schools, City departments, and government agencies to address potential threats of climate change is a way of guaranteeing timely and efficient response to climate challenges.



Timely implementation, along with the initiative of each resident, employee, and business of San Carlos, will put us well on our way to reducing our impact on the earth and the community in which we live while also preparing us for the challenges that lie ahead as a result of the inevitable transformations associated with climate change.

Suggested Implementation Prioritization

This chapter separates reduction measures into three time periods for implementation: 2005 to 2010, 2010 to 2015, and 2015 to 2020. Phases indicate when implementation of the measure begins; the reduction effects and overall maintenance of the program will extend well beyond the allotted phase. All reduction measures will begin implementation by 2020. The period of 2020 to 2030 will be an extension of Phase 3 for evaluation and expansion of all reduction measures. The reduction measures in this Plan are structured in a way that if a component of the measure becomes infeasible, other components can be added or modified, allowing the overall measure's reduction target to still be met.

Phase 1: Reduction Measures to Begin Implementation 2005 to 2010

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO2e per year)	First Year Costs per Metric Ton CO2e	Estimated Cost to City
25	Expand energy saving opportunities to businesses	13,300	\$0.18-\$0.38	\$2,500 - \$5,000
27	Improve residential energy efficiency	14,115	\$0.84	\$10,000
50	Encourage development that is mixed-use, infill, and higher density	5,544	\$0.81-\$1.62	\$4,500 - \$9,000
52	Increase housing density near transit	4,957	\$4.54 - \$9.08	*\$22,500 - \$45,000
55	Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools	170	\$923.52	**\$157,000
59	Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking	122	Negligible	***\$24,000 - \$48,000
66	Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles	59	\$6,537-\$7,027	***\$385,740 - \$414,648
77	Increase overall waste diversion by at least 1% per year	6,222	Negligible	Negligible
65	Enforce affordable housing development standards	192	Negligible	Negligible

*This cost would be included as part of the Zoning Ordinance update following adoption of the General Plan.

**This cost has been partially addressed through the recent installation of bicycle sharrows (Approx. \$45,000), implementation of the 2003 Bicycle and Transportation Plan, as well as Federal stimulus funding for crosswalks and curb ramp improvements (\$550,000).

***This cost would be reflected in the Equipment Replacement fund which would cover future costs as vehicles are replaced over time.

Phase 2: Reduction Measures to Begin Implementation 2010 - 2015

Page	Reduction Measure	2030 Emission Reductions (Metric tons CO ₂ e per year)	First Year Costs per Metric Ton CO ₂ e	Estimated Cost to City
31	Adopt a green building standard for new development and major remodels.	11,868	\$0.93	\$10,000
36	Create water and waste efficient landscapes.	416*	\$4.81-\$9.62	\$2,000 -\$4,000
37	Identify opportunities for on-site renewable energy generation on City and privately- owned property	394	\$1,282-1,320	**\$10,000
41	Implement reduction strategies included in the energy audit of City facilities and continue to monitor City facility performance	16	N/A	Unknown
42	Provide for increased albedo (reflectivity) of urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect	2,320	Negligible	Negligible
43	Encourage tree planting	356	\$35.96- \$71.91	\$12,800 -\$25,600
53	Increase bike parking	125	\$6 - \$12	\$900 - \$1,800
74	Support zero waste	83.7	\$59.74	\$5,000
76	Increase recycling and composting at public events	255	Negligible	Negligible

* These emissions are not included in the final reduction target analysis as emissions associated with the filtration and movement of water were not included in the City's baseline Greenhouse Gas Inventory as a disaggregated total.

**This cost would cover a feasibility study of on-site energy generation.

***This cost would partially be covered by the existing Building Division Code Enforcement Program.

Phase 3: Reduction Measures to Begin Implementation 2015 - 2020

Page	Reduction Measure	Emissions Reductions (Metric tons CO2e per year)	First Year Costs per Metric Ton CO2e	Estimated Cost to City
62	Provide for a shuttle service in order to increase transit ridership	1,733	\$1.15 - \$2.30	\$2,000 - \$4,000
63	Promote car sharing programs	1,158	\$1.55 - \$3.11	\$1,800 - \$3,600
67	Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles	49	\$200	\$10,000